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AR 201-13007

April 13, 2001

Ms. Christie Whitman, Administrator
US Environmental Protection Agency
P.O. Box 1473
Merrifield, VA 22116
Attn: Chemical Right-to-Know Program

RE: Robust Summary and Test Plan for Registration Number

Dear Ms. Whitman:

In accordance with the commitment to the HPV Challenge Program (AR-201) made by Schenectady International, Inc. (SII) in our letters to the EPA of November 18, 1999, December 13, 1999 and January 15, 2001, we are submitting herewith the Robust Summaries and Test Plans for 17 alkylphenols. The identity of these materials can be found in the Table of Contents of the Robust Summary (page 2).

It is our understanding that another company has also volunteered for *p-(alpha, alpha-*Dimethylbenzyl)phenol, CAS number 599-64-4. That company is performing some additional tests on this compound (results not yet available), which may verify some of the calculated values shown in our report.

The Robust Summaries and Test Plan are provided in three spiral bound volumes. In addition to the hard copy report, we have provided the entire document as an Adobe Acrobat (pdf) file on the enclosed disk.

If you have questions or comments regarding this submission, please contact me at the address shown above, by telephone at 518-347-4512, by FAX at 518-382-5417 or via email at dawn.hynes@siigroup.com.

Very truly yours,

Dawn E. Hynes
Toxicology and Regulatory Affairs Specialist

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Alkylphenols Category

Chemical Right-to-Know Initiative

HPV CHALLENGE PROGRAM

Contents **Page**

DEVELOPMENT OF ALKYLPHENOL CATEGORY

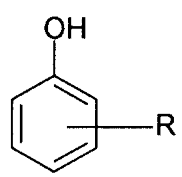
Seventeen alkylphenols listed as High Production Volume (HPV) chemicals are proposed as the members of a chemical category developed using the guidance given in the EPA document, *Development of Chemical Categories in the HPV Challenge Program*.

Originally these phenols were split into four categories using two criteria; position(s) of substituent, *ortho, meta, para* or a combination of these; and type of substituent, either alkyl or benzyl. However, evaluation of the available physical chemistry, environmental and toxicity data did not, overall, support these categories.

Various alternative classifications were therefore examined. The outcome was the single category now proposed.

Definition of category

Phenol substituted only with one or more alkyl and/or benzyl group(s).



Where R is one or more alkyl and/or benzyl groups

List of Category Members

Name	CAS No.
2,3,6-Trimethylphenol	2416-94-6
p-tert-Butylphenol	98-54-4
o-sec-Butylphenol	89-72-5
2-*tert*-Butylphenol	88-18-6
p-tert-Amylphenol	80-46-6
Heptyl derivs (*p*-heptylphenol)	72624-02-3
p-tert-Octylphenol	140-66-9
p-Octylphenol	1806-26-4
2,4-Di-*tert*-butylphenol	96-76-4
2,6-Di-*tert*-butylphenol	128-39-2
p-(*alpha, alpha*-Dimethylbenzyl)phenol	599-64-4

p-Nonylphenol	84852-15-3
2,4-Di-*tert*-pentylphenol	120-95-6
p-Dodecylphenol	210555-94-5
4-*sec*-Butyl-2,6-di-*tert*-butylphenol	17540-75-9
2,4,6-Tri-*tert*-butylphenol	732-26-3
2,4- Bis(*alpha, alpha*-dimethylbenzyl)phenol	2772-45-4

Justification for category

Physical chemistry

All the phenols have a single, common functional group; the phenolic hydroxyl. Because alkyl and benzyl groups have a small positive inductive effect all the group phenols are expected to have slightly higher acid dissociation constants (pKa) than phenol (pKa 10.0 at 25°C[1]). Data in a review of the physical chemistry properties of substituted phenols[2] confirms a limited pKa range of 9.9 to 10.9. Therefore none of the category phenols will be ionized significantly at environmental or physiological pH's.

Whilst the category phenols do not, overall, form an homologous series, values for several of the more important physical chemistry parameters do correlate with molecular weight. In particular water solubility and vapor pressure decrease with increasing molecular weight, whilst the octanol/water partition coefficient (log Kow) increases (Table 1).

Environmental distribution and fate

Direct photolysis is not expected to be a significant route of loss for any of the group because of limited absorbance above 290 nm[3] but indirect photolysis (atmospheric oxidation) has been estimated for all category members. None of the phenols are expected to be susceptible to abiotic hydrolysis under environmental conditions. Laboratory biodegradation study results were available for under half of the phenols but this information has been supplemented by the inclusion of calculated probabilities (made using the prediction program BIOWIN v3.65) for the remainder. In general the laboratory test data showed, as expected, that the lower molecular weight phenols with simple straight chain substituents were more biodegradable than those with higher molecular weights and more branching.

The level I fugacity modelling shows that, in general, phenols will be located primarily in the soil compartment but that lower molecular weight phenols, with correspondingly higher water solubilities and vapor pressures, will also be present in significant quantities in the air and water compartments (Table 2).

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[1] The Merck Index, 11th Edition, p. 1150, Merck & Co., Inc., Rahway, N.J.

[2] Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, *Chlorophenols and Alkylphenols: A Review and Correlation of Environmentally Relevant Properties and Fate in an Evaluative Environment*, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994

[3] For example *p*-methylphenol, a typical alkylphenol, has molar absorptivities of 18 l/mol-cm at 297.5 nm and only 1 l/mol-cm at 312.5 nm (Smith, J.H. et al, *Environmental Pathways of Selected Chemicals in Freshwater Systems: Part II. Laboratory Studies*, EPA-600/7-78-074, May 1978. Cited in Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., *Handbook of Chemical Property Calculation Methods*, McGraw-Hill, Inc., Washington, 1990, page 8-38).

Aquatic toxicity

The aquatic toxicity of phenols has been extensively investigated. Using the classification method of Verhaar[4] all the category phenols would be classified as Type 2 compounds (polar narcotics). Narcosis is a non-specific mode of toxic action caused by disruption of the cell membrane. The ability to induce narcosis is dependent on the hydrophobicity of the substance with biochemical activation or reaction involved. Such narcotic effects are also referred to as minimum or base-line toxicity. Polar narcotics such as the category phenols are usually characterised by having hydrogen bond donor acidity and are thought to act by a similar mechanism to the inert, narcotic compounds but to exhibit above base-line toxicity.

Values for different toxicity endpoints have been calculated using the software program ECOSAR[5], which comprises quantitative structure-activity relationships (QSARs), developed for calculating aquatic toxicity (Table 3). As expected for polar narcotic substances the aquatic toxicities of the category phenols increase in line with their log Kow. These calculated results are broadly supported by the available experimental data.

Mammalian toxicity

It is reasonable to consider the mutagenic potential of all the category phenols together since the only functional group is the phenolic, which is not a structural alert for mutagenicity. The data supports this as there is a consistent absence of genotoxicity in both bacterial and mammalian tests.

The acute (single-dose) toxicity of these alkylphenols also shows consistency, with LD_{50} values from about 1000 mg/kg to over 2000 mg/kg. This demonstrates a generally very low level of acute systemic toxicity, despite the general tendency for the chemicals to be, at least, irritants to skin.

A useful range of repeat-dose toxicity data is available for four of the category members. The studies range from 28-day and 90-day general toxicity studies, through developmental toxicity and reproductive/developmental screening, to recently conducted multigeneration reproductive studies. The dosage at which the relatively mild general toxicity appears tends only to fall below 100 mg/kg/day with extended treatment, and an overall NOAEL for the category is indicated to be in the region of 20 mg/kg/day. There was no evidence of an effect on reproductive function at dosages up to 150 mg/kg. One reproductive screening study reported increased 'breeding loss' and also reduced pup weight gain and survival in early lactation at 750 mg/kg, effects that might have been secondary to 'severe toxic symptoms' reported in the dams at this dosage. There was no effect on development, other than indications of a very mildly oestrogenic effect of *p*-nonylphenol at a high dose level (200-300 mg/kg/day) in a multigeneration study. For *p-tert*-butylphenol, long-term treatment with high dietary dose levels caused hyperplastic changes in the forestomach epithelium of rats and hamsters, a likely consequence of the irritancy of the material. The relevance of this for human hazard is doubtful, particularly as there is no analogous structure in humans to the forestomach of rodents.

The mammalian toxicity data is summarised in Table 4.

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[4] Verhaar, H.J.M. van Leeuwen, C.J. and Hermens, J.L.M., *Classifying Environmental Pollutants. 1: Structure-Activity Relationships for Prediction of Aquatic Toxicity*, Chemosphere (25), pp 471 – 491 (1992).
[5] ECOWIN v.0.99e. ECOSAR Classes for MicroSoft Windows, United States Environmental Protection Agency.

TABLE 1 - Physical Chemistry Properties of Alkylphenols

Phenol	CAS No.	MW	M.Pt. (°C)		B.Pt. (°C)		V.P. (Pa)		Log Kow		Water Sol. (mg/l)	
			Calc.	Exptl.	Calc.	Exptl.	Calc.	Exptl.	Calc.	Exptl.	Calc.	Exptl.
2,3,6-Trimethylphenol	2416-94-6	136	41	65	230	222	3.31	<10	3.15	2.72	668	1420
p-tert-Butylphenol	98-54-4	150	37	100	230	237	3.57	0.5	3.42	3.31	344	800
o-sec-Butylphenol	89-72-5	150	39	14	237	224	2.31		3.46	3.27[1]	319	
2-*tert*-Butylphenol	88-18-6	150	37	-7	230	223	3.57	12	3.42	3.31	344	
p-tert-Amylphenol	80-46-6	164	48	95	248	263	1.04		3.91	4.03	113	168
Heptyl derivs (*p*-heptylphenol)	72624-02-3	192	73		296		0.037		5.01		9.65	
p-tert-Octylphenol	140-66-9	206	73	81	281	282	0.091	0.21	5.28	4.12	4.82	18
p-Octylphenol	1806-26-4	206	83		311	296	0.013		5.50		3.11	
2,4-Di-*tert*-butylphenol	96-76-4	206	77	57	281	264	0.082	1.0	5.33		4.32	12
2,6-Di-*tert*-butylphenol	128-39-2	206	77	37	281	253	0.082	1.01	4.48	4.5	23.0	4.11
p-(*alpha, alpha*-Dimethylbenzyl)phenol	599-64-4	212	103	72	328	335	0.0030		4.12		43.3	
p-Nonylphenol	84852-15-3	220	90	25	316	310	0.0080	0.0046	5.92	3.28	1.16	3.93[2]
2,4-Di-*tert*-pentylphenol	120-95-6	234	89	26	311		0.011		6.31		0.444	
p-Dodecylphenol	210555-94-5	262	102		330	308	0.0028		7.17		0.058	
4-*sec*-Butyl-2,6-di-*tert*-butylphenol	17540-75-9	262	102	47	330	275	0.0028		6.43		0.248	
2,4,6-Tri-*tert*-butylphenol	732-26-3	262	104	131	325	278	0.0035	0.088	6.39	6.06	0.267	
2,4- Bis(*alpha, alpha*-dimethylbenzyl)phenol	2772-45-4	330	172	65	436	>300	7.8E-07		6.73		0.055	

The following programs were used for calculations:
Melting point, boiling point & vapor pressure: MPBWIN v1.30 Water solubility: WSKOW v1.33 Log Kow: KOWWIN v1.63
The above programs were run using the interface program EPIWIN v3

Numbers have been rounded and the mid-point reported for ranges.
Calculated results have been included in the robust summaries only when no experimental result was available. All calculations were performed specifically for this HPV submission.
All water solubility calculations were performed using log Kow values obtained using the program KOWWIN v1.63.

[1] Value from KOWWIN database
[2] Seawater

TABLE 2 - Level I Fugacity Modelling Results for Alkylphenols

Phenol	CAS No.	MW	Air	Soil	Water	Sus. Sed.	Fish	Sediment
			%	%	%	%	%	%
2,3,6-Trimethylphenol	2416-94-6	136	11.6	27.9	59.9	0.019	0.0016	0.62
p-tert-Butylphenol	98-54-4	150	0.66	63.0	34.9	0.044	0.0036	1.40
o-sec-Butylphenol	89-72-5	150	7.54	56.7	34.4	0.039	0.0032	1.26
2-*tert*-Butylphenol	88-18-6	150	27.0	46.3	25.6	0.032	0.0026	1.03
p-tert-Amylphenol	80-46-6	164	1.88	87.0	9.16	0.060	0.0049	1.93
Heptyl derivs (p-heptylphenol)	72624-02-3	192	0.16	96.6	1.07	0.067	0.0055	2.15
p-tert-Octylphenol	140-66-9	206	3.61	86.9	7.45	0.060	0.0049	1.93
p-Octylphenol	1806-26-4	206	0.060	97.4	0.35	0.068	0.0055	2.16
2,4-Di-*tert*-butylphenol	96-76-4	206	1.75	95.6	0.50	0.066	0.0054	2.12
2,6-Di-*tert*-butylphenol	128-39-2	206	25.6	70.3	2.51	0.049	0.0040	1.56
p-(alpha, alpha-Dimethylbenzyl)phenol	599-64-4	212	0.023	90.2	7.72	0.063	0.0051	2.00
p-Nonylphenol	84852-15-3	220	1.87	60.7	36.0	0.042	0.0034	1.35
2,4-Di-*tert*-pentylphenol	120-95-6	234	0.063	97.6	0.054	0.068	0.0055	2.17
p-Dodecylphenol	210555-94-5	262	0.019	97.7	0.0075	0.068	0.0055	2.17
4-*sec*-Butyl-2,6-di-*tert*-butylphenol	17540-75-9	262	0.0245	97.7	0.041	0.068	0.0055	2.17
2,4,6-Tri-*tert*-butylphenol	732-26-3	262	1.65	96.1	0.095	0.067	0.0054	2.13
2,4- Bis(alpha, alpha-dimethylbenzyl)phenol	2772-45-4	330	1.95E-05	97.7	0.021	0.068	0.0055	2.17

TABLE 3 - Summary of Acute Aquatic Toxicity Data for Alkylphenols

Phenol	CAS No.	MW	Calc. log Kow	Fish (96h LC50) Calc.	Fish (96h LC50) Exptl.	Daphnid (48h EC50) Calc.	Daphnid (48h EC50) Exptl.	Algae (96h EC50) Calc.	Algae (96h EC50) Exptl.
2,3,6-Trimethylphenol	2416-94-6	136	3.15	3.9	16	2.5	12.6[1]	6.4	19[2]
p-tert-Butylphenol	98-54-4	150	3.42	2.9	5.14	2.1	3.9	4.1	
o-sec-Butylphenol	89-72-5	150	3.46	2.8		2.0		3.8	
2-*tert*-Butylphenol	88-18-6	150	3.42	2.9	15.5[3]	2.1		4.1	
p-tert-Amylphenol	80-46-6	164	3.91	1.6		1.5		1.7	
Heptyl derivs (p-heptylphenol)	72624-02-3	192	5.01	0.40	0.85	0.61		0.21	2.5
p-tert-Octylphenol	140-66-9	206	5.28	0.29	0.25	0.51	0.27	0.13	1.9
p-Octylphenol	1806-26-4	206	5.50	0.21		0.41		0.082	
2,4-Di-*tert*-butylphenol	96-76-4	206	5.33	0.27		0.48		0.12	
2,6-Di-*tert*-butylphenol	128-39-2	206	4.48	0.90	7.6	1.1	1.7[1]	0.65	1.2
p-(alpha, alpha-Dimethylbenzyl)phenol	599-64-4	212	4.12	1.5		1.6		1.4	
p-Nonylphenol	84852-15-3	220	5.92	0.13	0.31	0.30	0.14	0.037	0.41
2,4-Di-*tert*-pentylphenol	120-95-6	234	6.31	0.076		0.22		0.018	
p-Dodecylphenol	210555-94-5	262	7.17	0.025		0.11		0.003	
4-*sec*-Butyl-2,6-di-*tert*-butylphenol	17540-75-9	262	6.43	0.072		0.22		0.016	
2,4,6-Tri-*tert*-butylphenol	732-26-3	262	6.39	0.076		0.226		0.017	
2,4- Bis(alpha, alpha-dimethylbenzyl)phenol	2772-45-4	330	6.73	0.059		0.21		0.011	

Toxicities were calculated by the program ECOSAR v0.99e using log Kow values estimated by KOWWIN v1.63. Both programs were run using the interface program EPIWIN v3. All toxicity endpoint values are in mg/l. Some values have been rounded and mid-points reported for ranges.

[1] 24h

[2] 72h

[3] Result from a study that used a formulation of 2-*tert*-butylphenol.

TABLE 4 - Available Data on Mammalian Toxicity of Alkylphenols

CAS No.	2416-94-6	98-54-4	89-72-5	88-18-6	80-46-6	72624-02-3	140-66-9	1806-26-4	96-76-4
Acute Toxicity (oral, mg/kg)	>2000	>2000	>200, <2000	789 oral, rat	1830	>200, <2000	>2000	1200	1500
Irritancy, skin (eye)	-	Irritant	Corrosive	Corrosive	Corrosive	Irritant (Irritant)	Mild irritant (Irritant)	-	Irritant
Genetic Toxicity	Neg	Neg*	Neg	Neg	Neg	Neg	Neg	-	-
Repeated-dose toxicity	-	Hamster 20 week, Rat 1 year: EL 15000 ppm	-		-	-	Rat 90d: NOAEL 30 ppm EL 300 ppm	-	-
Reproductive toxicity	-	-	-		-	-	Rat 2gen: NOAEL 200 ppm (systemic tox.), 2000 ppm (repro. tox.) EL 2000 ppm	-	-
Developmental toxicity	-	-	-		-	-	-	-	-

* Gene mutation assay using mouse lymphona showed no evidence of mutagenic response after 3 hrs (normal exposure time) but a positive response at 24 hrs.

EL = Effect level MatEL = Maternal effect level NOAEL = No-adverse effect level Dv = Developmental Mat = maternal Neg = Negative

- = No data available

TABLE 4 - Available Data on Mammalian Toxicity of Alkylphenols (continued)

CAS No.	128-39-2	599-64-4	84852-15-3	120-95-6	210555-94-5	17540-75-9	732-26-3	2772-45-4
Acute Toxicity (oral, mg/kg)	>5000	1770	1882	920	-	4800	1670 (males) 1610 (females)	-
Irritancy, skin (eye)	Irritant	-	Corrosive (Irritant)		-	-		-
Genetic Toxicity	Neg	Neg	Neg	-	-	-	-	-
Repeated-dose toxicity	Rat 28d: NOAEL 15 mg/kg/d EL 100 mg/kg/d	-	Rat 28d: NOAEL 100 mg/kg/d EL 400 mg/kg/d Rat 90d: NOAEL 50 mg/kg/d EL 150 mg/kg/d	-	-	-	Rat 24 months: NOAEL 30 ppm Dogs 11 days: increased liver metabolism above 50 mg/kg/d + some autonomic signs at 450 mg/kg/d.	-
Reproductive toxicity	Rat 421: NOAEL 150 mg/kg/d MatEL 750 mg/kg/d	-	Rat 3gen: NOAEL (systemic & repro tox.) 200 ppm *ca* 20 mg/kg/d EL (repro tox.) 650 ppm *ca* 50 mg/kg/d	-	-	-		-
Developmental toxicity		-	Rat: MatNOAEL 75 mg/kg/d DvNOAEL 300 mg/kg MatEL 300 mg/kg/d	-	-	-		-

EL = Effect level MatEL = Maternal effect level NOAEL = No-adverse effect level Dv = Developmental Mat = maternal Neg = Negative - = No data available

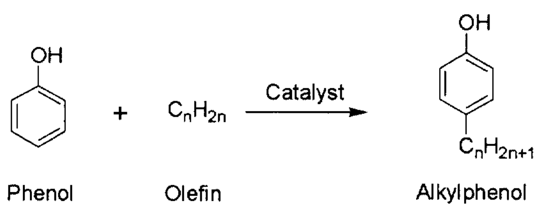
INDUSTRIAL MANUFACTURING AND COMMERCIAL APPLICATIONS OF ALKYLPHENOLS

para-Substituted alkylphenols

The *para*-substituted alkylphenols are typically made from an olefin and phenol using an acid catalyst (Figure 1). The side chains tend to be highly branched with predominately a tertiary carbon attached to the phenol ring. In some cases, a small amount of ortho isomer is co-produced and must be removed in a purification step.

The olefins are either a relatively pure, low molecular weight material with an α-olefin structure such as for PTBP, PTAP, and PTOP or a mixture of isomeric olefins as for PHP, POP, PNP and PDDP. (See Table 5).

Figure 1 - Synthesis of para-substituted alkylphenols



The manufacturing processes for the various *para*-substituted alkylphenols, are conducted in fully automated, closed systems that have been engineered to comply with applicable environmental laws and regulations. In the typical reaction, a fixed bed reactor containing a solid acid catalyst is fed with phenol and olefin at the appropriate ratio to produce a mixture of *ortho*- and *para*-alkylphenol and a small amount of by-products. The product is recovered at the required quality by fractional vacuum distillation.

Table 5 – Structure, manufacture and commercial applications of *para*-substituted alkylphenols

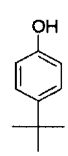
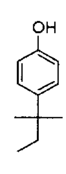
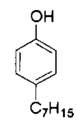
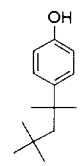
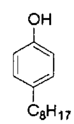
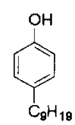
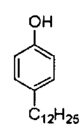
Compound	Name	CAS NO.	Starting Olefin	Structure	Applications
PTBP	*p-tert*-Butylphenol	98-54-4	Isobutylene		Phosphate esters, fragrances, oil field chemicals, demulsifiers, polycarbonate chain terminator, glycidyl ethers
PTAP	*p-tert*-Amylphenol	80-46-6	Isoamylene		Demulsifiers, biocides, fragrances

Table 5 (continued)

Compound	Name	CAS NO.	Starting Olefin	Structure	Applications
PHP	Heptyl derivs (*p*-Heptylphenol)	72624-02-3	Heptylene		Oil additive intermediate, phenolic resins
PTOP	*p-tert*-Octylphenol	140-66-9	Diisobutylene		Surfactants, tackifier resins, ink resins, polycarbonate chain terminator, ultraviolet stabilizers
POP	*p*-Octylphenol	1806-26-4	Octene		Surfactants, phenolic resins
PNP	*p*-Nonylphenol	84852-15-3	Nonene		Demulsifiers, antioxidant intermediate, surfactants, epoxy resin hardener, heat stabilizer for PVC , phenolic resins
PDDP	*p*-Dodecylphenol	210555-94-2	Dodecene		Surfactants, lube oil additives, intermediate, phenolic resins

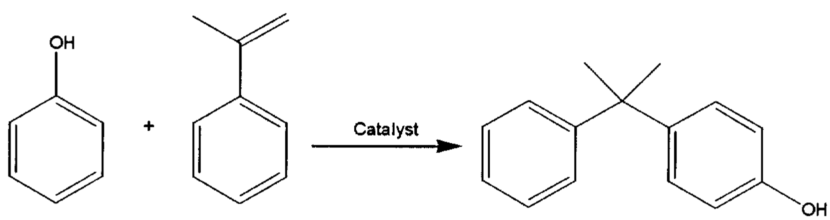
Alkylphenols tend to darken on contact with iron and oxygen. These materials must be stored and shipped in stainless steel vessels under an inert atmosphere. Contact with carbon steel should be avoided.

The commercial uses of the *para*-substituted alkylphenols are numerous and many are listed in Table 5. Typical applications include the use of the alkylphenols as intermediates in the synthesis of primary and secondary antioxidants, demulsifiers, surfactants, lube oil additives, biocides, fragrances, and various types of tackifier, ink and phenolic resins. They also find use as polymerization inhibitors, epoxy resin hardeners, heat stabilizers, and polycarbonate chain terminators.

***p*-(*alpha, alpha*-Dimethylbenzyl)phenol (4-cumylphenol)**

The manufacturing process for 4-cumylphenol [PCP, *para*-cumylphenol, *p*-(*alpha, alpha*-dimethylbenzyl)phenol4-(1-methyl-1-phenylethyl)phenol], CAS RN = 599-64-4, is conducted in a fully automated, closed system that has been engineered to comply with applicable environmental regulations. An appropriate blend of phenol and 2-methylstyrene [α-methylstyrene, AMS] is passed through a fixed-bed of a solid acid catalyst. The crude alkylphenol stream containing phenol, cumylphenol isomers and reaction byproducts is rectified by vacuum fractional distillation to achieve the required purity for PCP. The process is depicted by the chemical equation in Figure 2.

Figure 2 – Synthesis of PCP

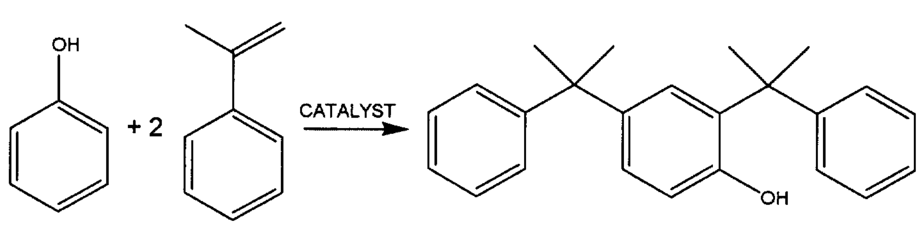


PCP exhibits physical characteristics and chemical characteristics similar to those of other para-alkylated phenols. PCP is used as a chemical intermediate in the synthesis of specialty surfactants and phenolic resins. Its primary use is as a chain-stopper in polycarbonate resins to control molecular weight and physical properties.

2,4- Bis(*alpha, alpha*- dimethylbenzyl)phenol (2,4-dicumylphenol)

The manufacturing process for 2,4-dicumylphenol [2,4-DCP; 2,4-*bis*(1-methyl-1-phenethyl)phenol], CAS RN = 2772-45-4, is conducted in a processing unit that has been engineered to comply with applicable environmental regulations. α-Methylstyrene (AMS) is added into a reactor containing phenol and an acidic catalyst at a controlled rate. Once the reactor contents have reached the desired composition, the catalyst is separated from the crude alkylate. This material, containing mono-cumylphenol isomers, DCP and byproducts is rectified by fractional vacuum distillation to achieve the desired purity. The process is shown in Figure 3.

Figure 3 – Synthesis of 2,4-DCP

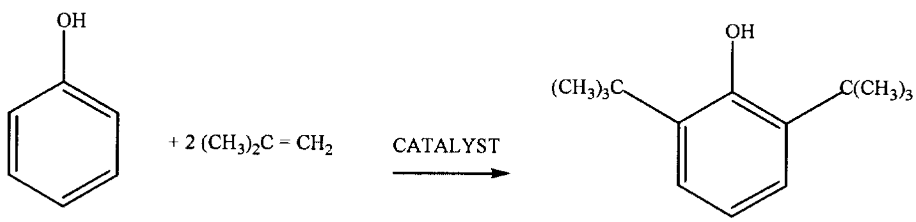


The predominant use 2,4-DCP is as a chemical intermediate. In its primary use, 2,4-DCP is converted to a benzotriazole to produce a UV stabilizer. It can also be used as a primary antioxidant or can be converted to a secondary antioxidant as a phosphite. In each case, the material is used in high temperature polymers where higher thermal stability is needed during high temperature molding processes.

2,6-Di-*tert*-butylphenol

The manufacturing process for 2,6-di-*tert*-butylphenol (2,6-DTBP), CAS RN = 128-39-2, is conducted in a fully automated, closed system that has been engineered to comply with applicable environmental regulations. An autoclave reactor is first charged with phenol and catalyst. Then isobutylene is added into the reaction under controlled conditions to generate a crude alkylate. The catalyst is separated from this alkylate. The product is recovered at the quality required by fractional vacuum distillation. See Figure 4.

Figure 4 – Synthesis of 2,6-DTBP



Like other alkylphenols, 2,6-DTBP is susceptible to discoloration in air. This is the result of an oxidation reaction with oxygen. The presence of two ortho-tert-butyl groups stabilizes the phenoxy radical generated by oxidation. This stabilizing influence also explains the good antioxidant property of 2,6-DTBP.

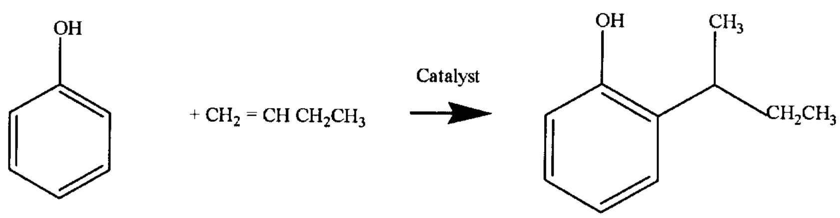
2,6-DTBP can be used as an antioxidant, and it is an important commercial building block for hindered phenolic antioxidants. In these applications, reactions are carried out at the 4-position of 2,6-DTBP to impart a desirable characteristic, such as solubility or reduced volatility, to the antioxidant. 2,6-DTBP can be utilized as a starting material in the synthesis of 4,4'-biphenol. Two molecules of 2,6-DTBP are oxidatively coupled under appropriate conditions to the tetra-substituted biphenol. The butyl groups are subsequently cleaved from the ring to generate the biphenol.

***o*-*sec*-Butylphenol (2-*sec*-butylphenol)**

2-*sec*-Butylphenol (OSBP) CAS RN = 89-72-5, can be produced by two different processes. Both processes have been engineered to comply with applicable environmental regulations using fully automated, closed systems. The choice of process is based on business considerations.

In the first process, a mixture of 1-butene and phenol is passed through a fixed bed of ion exchange resin. The crude alkylphenol, containing phenol, sec-butylphenol isomers and other alkylates is rectified by vacuum fractional distillation. In the other process, 1-butene is metered into a solution of a homogeneous catalyst in phenol. Again the crude alkylphenol is rectified by fractional vacuum distillation to achieve the required OSBP purity. Both processes are depicted by the chemical equation in Figure 5.

Figure 5 – Synthesis of OSBP

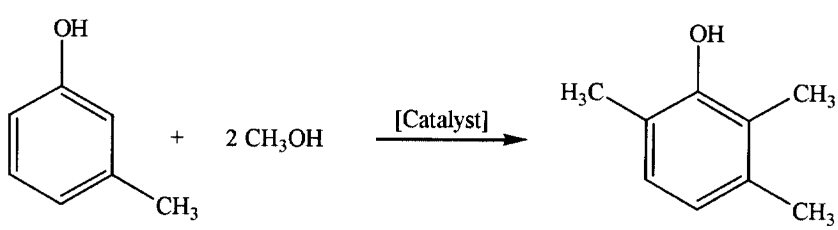


OSBP is mainly used as a chemical intermediate in the synthesis of insecticides, herbicides and as a polymerization inhibitor. It undergoes reactions on the aromatic ring and the phenolic hydroxyl group. It is somewhat less acidic than phenol.

2,3,6-Trimethylphenol

The manufacturing process for 2,3,6-trimethylphenol (TMP), CAS RN = 2416-94-6, is conducted in an automated, closed system that has been engineered to comply with applicable environmental regulations. A fixed bed reactor containing a mixed metal oxide catalyst is fed with a mixture of methanol and 3-methylphenol. The product is separated from the byproduct, water, then distilled under fractional vacuum distillation to achieve the quality required. See Figure 6.

Figure 6 – Synthesis of 2,3,6-TMP



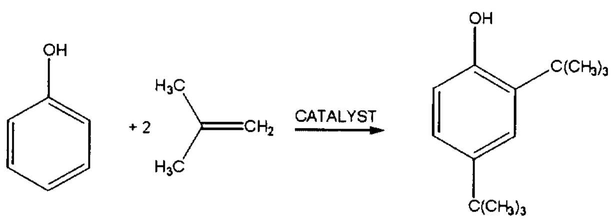
2,3,6-TMP is an intermediate in synthetic Vitamin E, in antioxidants and in polymer applications. Each application involves the susceptibility of the phenolic ring to oxidation. Under normal storage conditions, 2,3,6-TMP is blanketed with an inert gas to mitigate the reaction between atmospheric 0_2 and 2,3,6-TMP.

2,3,6-TMP also displays another characteristic of phenols. It has a weakly acidic proton which can react with bases.

2,4-Di-*tert*-butylphenol

The manufacturing process for 2,4-di-*tertiary*-butylphenol (2,4-DTBP), CAS RN = 96-76-4, is conducted in a fully automated, closed system that has been engineered to comply with applicable environmental regulations. A reactor is first charged with phenol and an acid catalyst. Then isobutylene is added into the reaction under controlled conditions to generate a crude alkylate. The crude alkylate contains 2,4-DTBP, mono- and tri-butylphenol, some isomers and by-products. The catalyst is separated from this alkylate. The product is recovered at the required quality by fractional vacuum distillation. The chemical equation for the process is shown in Figure 7.

Figure 7 – Synthesis of 2,4-DTBP

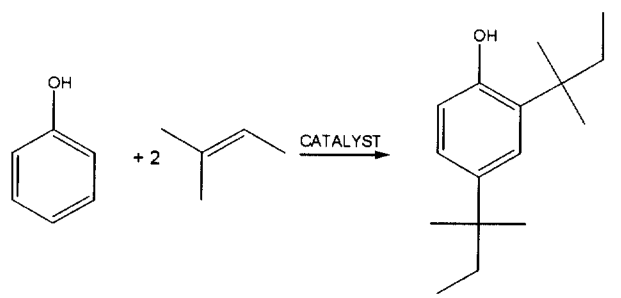


The primary use of 2,4-DTBP is in the synthesis of triaryl phosphites. These are used as secondary antioxidants, primarily in plastics. 2,4-DTBP also can be used to produce primary phenolic antioxidants by condensing it with an aldehyde at the ortho position to produce a high molecular weight bisphenolic, which stabilizes polyolefins, styrenics and natural or synthetic rubber. 2,4-DTPB can also be converted benzotriazole derivatives or an ester of 3,5-di-tert-butyl-4-hydroxybenzoic acid, both of which are used as UV stabilizers.

2,4-Di-*tert*-pentylphenol (2,4-Di-*tert*-amylphenol)

The process for manufacturing 2,4-di-*tertiary*-amylphenol [2,4-DTAP; 2,4-bis(1,1-dimethylpropyl)phenol], CAS RN = 120-95-6, is conducted in a fully automated, closed system that has been engineered to comply with applicable environmental regulations. First, a reactor is charged with phenol and an acidic catalyst. Then isoamylene (a 90/10 mixture of 2-methyl-2-butene and 2-methyl-1-butene) is added into the reaction under controlled conditions to generate a crude alkylate. The crude alkylate contains 2,4-DTAP, mono- and tri-amylphenol, some isomers and by-products. The catalyst is separated from this alkylate. The product is recovered at the required quality by fractional vacuum distillation. The chemical equation for the process is shown in Figure 8.

Figure 8 – Synthesis of 2,4-DTAP

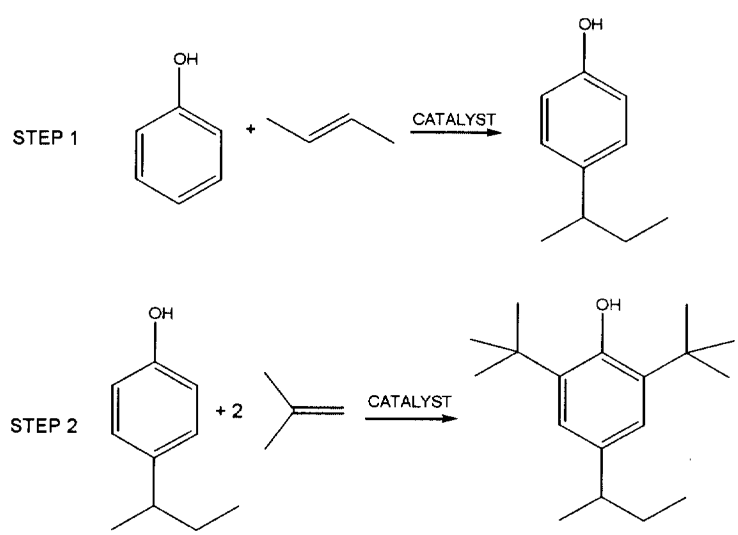


The major use of 2,4-DTBP is in the production of UV stabilizers. The major one is a benzotriazole-based UV absorber used in polyolefin films, outdoor furniture and automotive clear coat finishes. A number of phenoxyacetic acid derivatives are used in the photographic industry. Reaction with ethylene oxide produces a speciality surfactant that can be used to treat cotton fibres. A similar product can be used as a fuel additive acting as a corrosion inhibitor.

4-*sec*-Butyl-2,6-di-*tert*-butylphenol (ISONOX® 132)

The process for manufacturing ISONOX® 132 [2,6-di-*tert*-4-*sec*-butylphenol], CAS RN = 17540-75-9, is a two-step process that is conducted in fully automated, closed systems that have been engineered to comply with applicable environmental regulations. In the first step, a fixed bed reactor containing a solid acid catalyst is charged with phenol and 2-butene to produce a mixture of ortho- and *para-sec*-butylphenol (OSBP & PSBP). This mixture is rectified by distillation. In the second step, the purified PSBP, isobutylene, and an appropriate catalyst are added in a reactor under controlled conditions to generate a crude alkylate. The crude alkylate is separated from the catalyst. The product is recovered at the required quality by fractional vacuum distillation. The chemical equation for the process is shown in Figure 9.

Figure 9 – Synthesis of ISONOX® 132

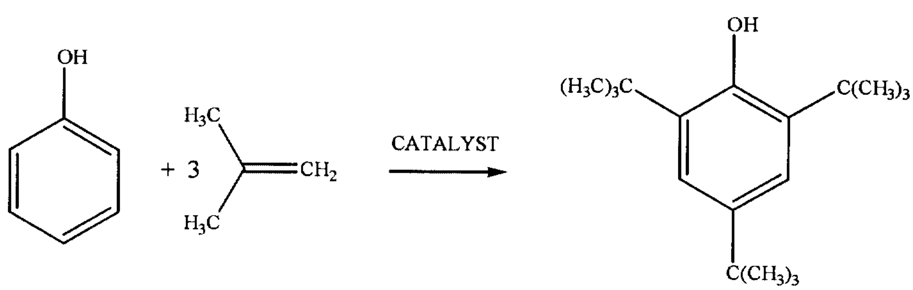


The primary use of ISONOX® 132 is as an antioxidant. It is a low cost, highly active liquid stabilizer for polyols, PVC, polyurethane, adhesives and functional fluids. ISONOX® 132 has received FDA approval for use as an antioxidant in indirect food contact applications in plasticized vinyl chloride homo- and copolymers (PVC).

2,4,6-Tri-*tert*-butylphenol

The manufacturing process for 2,4,6-tri-*tert*-butylphenol (2,4,6-TTBP), CAS RN = 732-26-3, is conducted in a fully automated, closed system that has been engineered to comply with applicable environmental regulations. An autoclave reactor is first charged with phenol and catalyst. Then isobutylene is added into the reaction under controlled conditions to generate a crude alkylate. See Figure 10. The catalyst is separated from this alkylate. The product is recovered at the quality required by either fractional vacuum distillation or recrystallization in an appropriate solvent.

Figure 10 – Synthesis of 2,4,6-TTBP

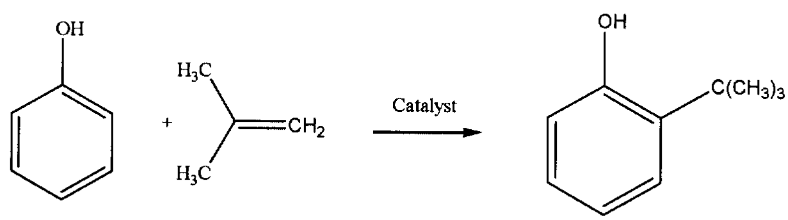


Like most alkylphenols with bulky substituents, 2,4,6-DTBP can be used as a primary antioxidant or as an intermediate in the synthesis of primary antioxidants. Its primary commercial use, however, is an intermediate in the synthesis of polymer stabilizers that provide enhanced hydrolytic, thermal oxidative, and UV stability to thermoplastic resins.

2-*tert*-Butylphenol

The manufacturing process for 2-*tert*-butylphenol (*ortho-tertiary* butylphenol, OTBP), CAS RN = 88-18-6, has been engineered to comply with applicable environmental regulations using a fully automated, closed system. Phenol and an appropriate *ortho*-alkylating catalyst are charged to a reactor followed by the controlled addition of isobutylene to generate a crude alkylate. See Figure 11. When the reaction is complete, the catalyst is removed from the mixture and the product is recovered at the required quality by fractional vacuum distillation.

Figure 11 – Synthesis of OTBP



OTBP is used as a starting material for the synthesis of flavor and fragrance chemicals, antioxidants, insecticides, and phenolic resins. Compounds for the fragrance industry can be made from cis-2-*tert*-butylcyclohexanol [7214-18-8] that is obtained by hydrogenation of OTBP in the presence of Pd/Al_2O_3 or Ru/Al_2O_3 catalysts.

ALKYLPHENOL CATEGORY TEST PLANS

CAS No.	2416-94-6	98-54-4	89-72-5	88-18-6	80-46-6	72624-02-3	140-66-9	1806-26-4	96-76-4	128-39-2	599-64-4	84852-15-3	120-95-6	210555-94-5	17540-75-9	732-26-3	2772-45-4
Physical Chemistry Properties																	
Melting point	D	D	D	D	D	C	D	C	D	D	D	D	D	C	D	D	D
Boiling point	D	D	D	D	D	C	D	D	D	D	D	D	C	D	D	D	D
Vapour pressure	D	D	C	D	C	C	D	C	D	D	C	D	C	C	C	D	C
Log Kow	D	D	C	D	D	C	D	C	C	D	C	D	C	C	C	D	C
Water solubility	D	D	C	C	D	C	D	C	D	D	C	D	C	C	C	C	C

Key: C= endpoints fulfilled using calculated data

D= endpoints fulfilled using adequate existing experimental data

ALKYLPHENOL CATEGORY TEST PLANS (continued)

CAS No.	2416-94-6	98-54-4	89-72-5	88-18-6	80-46-6	72624-02-3	140-66-9	1806-26-4	96-76-4	128-39-2	599-64-4	84852-15-3	120-95-6	210555-94-5	17540-75-9	732-26-3	2772-45-4
Environmental Fate and Pathway																	
Photodegradation	C	C	C	C	C	C	C	C	C	C/D	C	C	C	C	C	C	C
Stability in water	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Transport/ Distribution-fugacity model	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Biodegradation	D	D	S	S	S	S	D	S	D	D	S	D	S	S	S	S	S
Ecotoxicology																	
Acute Fish	C/D	C/D	C	C/D	C	C/D	C/D	C	C	C/D	C	C/D	C	C	C	C	C
Acute Algae	C/D	C	C	C	C	C/D	C/D	C	C	C/D	C	C/D	C	C	C	C	C
Acute Daphnia	C/D	C/D	C	C	C	C	C/D	C	C	C/D	C	C/D	C	C	C	C	C

Key: *= Although no studies on abiotic hydrolysis were found, no testing is proposed because the category phenols do not possess any functional groups that are regarded as being susceptible to hydrolysis under environmental conditions.

T= testing required (Level III Fugacity Model to be run)

D= endpoints fulfilled using adequate existing experimental data

C= endpoints fulfilled using calculated data

S = endpoints fulfilled using category approach (read across).

ALKYLPHENOL CATEGORY TEST PLANS (continued)

CAS No.	2416-94-6	98-54-4	89-72-5	88-18-6	80-46-6	72624-02-3	140-66-9	1806-26-4	96-76-4	128-39-2	599-64-4	84852-15-3	120-95-6	210555-94-5	17540-75-9	732-26-3	2772-45-4
TOXICOLOGY																	
Acute toxicity	D	D	D	D	S	D	D	D	D	D	D	D	D	S	D	D	S
Genetic toxicity- bacterial	D	D	D	D	D	D	D	S	S	D	D	D	S	S	S	S	S
Genetic toxicity- non bacterial- *in vivo*	S	S	S	S	S	S	S	S	S	D	S	D	S	S	S	S	S
Genetic toxicity- non bacterial- *in vitro*	S	T	S	S	S	S	S	S	S	D	S	D	S	S	S	S	S
Repeated Toxicity	S	D	S	S	S	S	D	S	S	D	S	D	S	S	S	D	S
Repro/ Developm. Toxicity	S	S	S	S	S	S	D	S	S	D	S	D	S	S	S	S	S

Key:

S= endpoints fulfilled using category approach (read across)

D= endpoints fulfilled using adequate existing experimental data

T = testing required

AR 201-13007B

ROBUST SUMMARIES

Physical/Chemical Elements

Notes on calculations etc.

Calculated values for the physical chemistry properties of the category phenols were determined specifically for this HPV submission.

Where an experimental value was available this has been included in a Robust Summary in preference to a calculated value. The single apparent exception to this is for the water solubility of *p*-nonylphenol (CAS No. 84852-15-3) where Summaries containing both the calculated and experimental values have been included because the latter was for solubility in seawater.

All calculated values were obtained using one of the SYRACUSE chemical properties prediction programs run using the interface program EPIWIN v3.

Water solubility values were calculated using log Kow values obtained from the program KOWWIN v1.63.

Environmental Fate and Pathway Elements

Photodegradation

In the absence of experimental data on the direct aqueous photolysis of the category phenols the reported half-life for *p*-cresol (4-methylphenol), a related substance, has been included in all the robust summaries under the heading "Other".

Level I Fugacity Calculations

Water solubility, log Kow, vapour pressure and melting point values were taken from the Physical/Chemical Elements Robust Summaries. That is to say experimental values were used in preference to those calculated.

Ecotoxicity Elements

The aquatic toxicity prediction program ECOSAR v0.99e (run with the interface program EPIWIN v3) was used to calculate values for the endpoints: Fish LC50 (96-hr), Daphnid EC50 (48-hr) and Algae EC50 (96-hr). All of these results have been reported in Robust Summaries. Calculated log Kow values obtained from the program KOWWIN were used throughout.

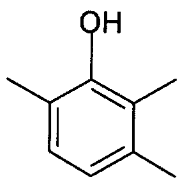
PHYSICAL/CHEMICAL ELEMENTS

1.1 MELTING POINT

TEST SUBSTANCE

2,3,6-Trimethylphenol

CAS No. 2416-94-6



METHOD

Method/guideline followed: information not available in database.

GLP (Y/N): No.

Year study performed: 1994.

RESULTS

Melting point: 60-62°C.

CONCLUSIONS

The test substance has a melting point range of 60-62°C.

DATA QUALITY

Not a GLP study.

Information taken from IUCLID database.

Purity of the test substance / decomposition: information not available in database.

REFERENCES

BASF AG, Sicherheitsdatensblatt Trimethylphenol fest (01.02.1994) as cited in IUCLID database.

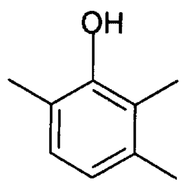
OTHER

1.2 MELTING POINT

TEST SUBSTANCE

2,3,6-Trimethylphenol

CAS No. 2416-94-6



METHOD

Method/guideline followed: Schenectady International Inc. internal procedure.

GLP (Y/N): No.

Year study performed: 1998.

RESULTS

Melting point: 64.9°C.

CONCLUSIONS

The test substance has a melting point of 64.9°C.

DATA QUALITY

Not a GLP study.

Information taken from a technical datasheet.

Purity of the test substance given as typically 99.3% minimum.

Decomposition: no information available.

REFERENCES

Schenectady International Inc. Technical Datasheet (06.11.98).

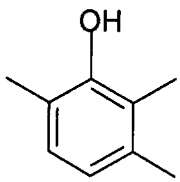
OTHER

2.1 BOILING POINT

TEST SUBSTANCE

2,3,6-Trimethylphenol

CAS No. 2416-94-6



METHOD

Method/guideline followed: information not available in database.

GLP (Y/N): no.

Year study performed: 1994.

RESULTS

Boiling point: 215°C.

Pressure: assumed to be atmospheric.

CONCLUSIONS

The test substance has a boiling point of 215°C.

DATA QUALITY

Not a GLP study.

Information taken from IUCLID database.

Purity of the test substance / decomposition: information not available in database.

REFERENCES

BASF AG, Sicherheitsdatensblatt Trimethylphenol fest (01.02.1994) as cited in IUCLID database.

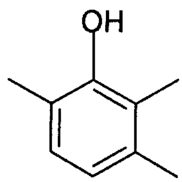
OTHER

2.2 BOILING POINT

TEST SUBSTANCE

2,3,6-Trimethylphenol

CAS No. 2416-94-6



METHOD

Method/guideline followed: Schenectady International Inc. internal procedure.

GLP (Y/N): no.

Year study performed: 1998.

RESULTS

Boiling point: 222°C @ 760 mm Hg.

CONCLUSIONS

The test substance has a boiling point of 222°C @ 760 mm Hg.

DATA QUALITY

Not a GLP study.

Information taken from a technical datasheet.

Purity of the test substance given as typically 99.3% minimum.

Decomposition: no information available.

REFERENCES

Schenectady International inc. Technical Datasheet (06/11/98).

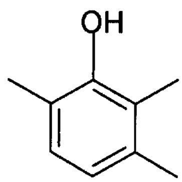
OTHER

3.1 VAPOUR PRESSURE

TEST SUBSTANCE

2,3,6-Trimethylphenol

CAS No. 2416-94-6



METHOD

Method/guideline followed: information not available in database.

GLP (Y/N): no.

Year study performed: 1994.

RESULTS

Vapour pressure: <10 Pa @ 20°C.

CONCLUSIONS

The test substance has a vapour pressure of : <10 Pa @ 20°C.

DATA QUALITY

Not a GLP study.

Information taken from IUCLID database.

Purity of the test substance / decomposition: information not available in database.

REFERENCES

BASF AG, Sicherheitsdatensblatt Trimethylphenol fest (01.02.1994) as cited in IUCLID database.

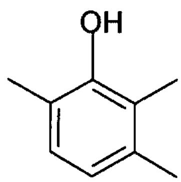
OTHER

4.1 PARTITION COEFFICIENT

TEST SUBSTANCE

2,3,6-Trimethylphenol

CAS No. 2416-94-6



METHOD

Method/guideline followed: OECD Guideline 107 "Partition Coefficient (n-octanol/water), Flask-shaking Method.

GLP (Y/N): not known.

Year study performed: not known.

RESULTS

Log Kow: 2.72 at 25°.

CONCLUSIONS

The test substance has a log Kow of 2.72 at 25°C.

DATA QUALITY

Method follows OECD guideline. Temperature but not test substance purity given.

Information taken from IUCLID database.

REFERENCES

BASF AG, Analytisches Labor, unveroeffentlichte Unterschung (J. Nr. 129299/03 vom 01.07.88) as cited in IUCLID Database.

OTHER

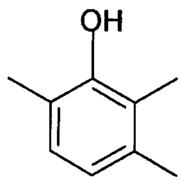
Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 (Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994).

5.1 WATER SOLUBILITY

TEST SUBSTANCE

2,3,6-Trimethylphenol

CAS No. 2416-94-6



METHOD

Method/guideline followed: information not available in database.

GLP (Y/N): no.

Year study performed: not known.

RESULTS

Water solubility: 1.42 g/l at 25°C.

CONCLUSIONS

The solubility of the test substance in water is 1.42 g/l at 25°C.

DATA QUALITY

Not a GLP study.

Information taken from IUCLID database.

Purity of the test substance: information not available in database.

REFERENCES

BASF AG, Analtyisches Labor, unveroeffentlichte Untersuchung (J. Nr. 107545/01 vom 07.06.89) as cited in IUCLID Database.

OTHER

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 (Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994).

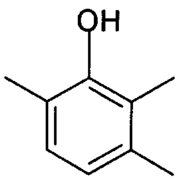
ENVIRONMENTAL FATE AND PATHWAY ELEMENTS

6.1 PHOTODEGRADATION

TEST SUBSTANCE

2,3,6-Trimethylphenol

CAS No. 2416-94-6



METHOD

Method/guideline followed: calculation using the programme AOPWIN v1.88.

Test type: calculation of the rate constant for the atmospheric reaction between photochemically produced hydroxyl radicals and the test substance in the vapour phase.

GLP (Y/N): no.

Year study performed: calculation made for this HPV submission.

RESULTS

Sensitizer: hydroxyl radical.

Overall hydroxyl rate constant: 131×10^{-12} cm^3/molecule-sec.

Half-life: 58.7 minutes.

CONCLUSIONS

The programme estimates that in a typical atmosphere 50% of the test substance will undergo reaction in 58.7 minutes.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. AOPWIN v 1.88.

OTHER

The IUCLID database contains a review of a paper (Faust, B.C., Hoigne, J., Environ. Sci. Tech.21, 957-962 (1987)) on indirect photolysis of the test substance in water but gives no details as to method or results. It does however contain the following summary:

"In natural sunlit waters, 2,3,6-trimethyl phenol is expected to rapidly photooxidize. Photooxidation half-lifes of the 2,4,6,-trimethylphenol isomer in mid-latitude surface waters during mid-summer are typically on the order of 4 – 11 hours, and half-lifes for the 2,3,6-trimethyl phenol isomer are expected to be on the same order of magnitude."

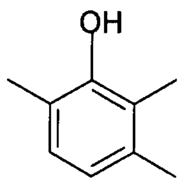
No experimental data was found on direct aqueous photolysis of the test substance. However, *p*-cresol, a related substance, in aqueous solution is reported as having a half-life of 35 days in sunlight (Smith, J.H. et al, "Environmental Pathways of Selected Chemicals in Freshwater Systems: Part II. Laboratory Studies," EPA-600/7-78-074, May 1978. Cited in Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, page 8-38.

7.1 STABILITY IN WATER

TEST SUBSTANCE

2,3,6-Trimethylphenol

CAS No. 2416-94-6



COMMENT

No abiotic hydrolysis studies were located.

The category phenols do not possess any functional groups that are regarded as being susceptible to hydrolysis under environmental conditions (Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, pages 7-4 and 7-5).

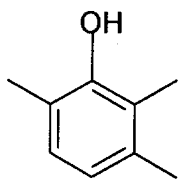
The software prediction programme HYDROWIN v1.66 cannot estimate hydrolysis rate constants for phenols.

8.1 TRANSPORT BETWEEN ENVIRONMENTAL COMPARTMENTS (FUGACITY)

TEST SUBSTANCE

2,3,6-Trimethylphenol

CAS No. 2416-94-6



COMMENT

Test type: Calculation of partitioning between environmental compartments.

Year study performed: Model run for this HPV submission.

Model: Level 1 Fugacity-Based Environmental Partitioning Model v2.11.

Input values

Chemical specific

Molecular mass:	136
Data temperature (°C):	25
Water solubility (mg/l):	1420
Vapour pressure (Pa):	10
Log Kow:	2.72
Melting point (C):	64.9

Environmental conditions: defaults used.

RESULTS

Environmental compartment	percentage of test substance
Air	11.6
Soil	27.9
Water	59.9
suspended sediment	0.019
fish	0.0016
Sediment	0.62

DATA QUALITY

The Mackay Level I Fugacity Model estimates the equilibrium distribution of a fixed quantity of a non-reacting chemical in a closed environment at equilibrium; with no degradation reactions and no flow or intermedia transport processes. The chemical is assumed to distribute instantaneously to an equilibrium concentration and therefore the medium receiving the emission is unimportant. This model is an aid to understanding the physical chemistry properties that are of greatest importance in determining the environmental distribution of substances; it is not a tool to predict actual or likely concentrations in a real environment.

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 and therefore their physical chemistry properties are unlikely to be affected by the pH values normally found in the environment.

REFERENCES

This software program is available with the publication: Mackay, D., Multimedia environmental models: the fugacity approach, Lewis Publishers Inc., Chelsea, MI, 1991.

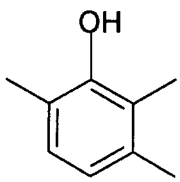
OTHER

9.1 BIODEGRADATION

TEST SUBSTANCE

2,3,6-Trimethylphenol

CAS No. 2416-94-6



METHOD

Method/guideline followed: Zahn-Wellens Test.

Test type: aerobic.

GLP (Y/N): no.

Year study performed: 1981.

Contact time: 14 days.

Innoculum: activated sludge.

Concentration: 1260 mg/l.

RESULTS

Percentage degradation: 6% after 3 hours, 64% after 7 days and 98% after 14 days.

CONCLUSIONS

2,3,6-Trimethylphenol was inherently biodegradable under the conditions of the study.

DATA QUALITY

Not a GLP study.

REFERENCES

BASF AG, Labor fuer Abbau und Analytik; unveroeffentlichte Mitteilung vom 11.12.90 (75076/1981) as cited in IUCLID database.

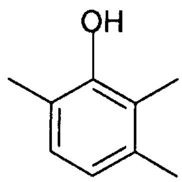
OTHER

9.2 BIODEGRADATION

TEST SUBSTANCE

2,3,6-Trimethylphenol

CAS No. 2416-94-6



METHOD

Method/guideline followed: Two laboratory anaerobic digestors, AD1 and AD2, were prepared by adding 180 ml treated well water (W13) (sampled from a well located under an area of coal-tar contaminated ground water and with a known alkylphenol content) and 2 ml of ferrous sulfide suspension to 250 ml serum bottles. Aliquots (20 ml) from a second well (P14) located 143 m downgradient from the first were added to each digestor as the innoculum. Both digestors were purged with oxygen-free nitrogen. Digestor AD1 was operated in a semi-continuous addition mode for culture enrichment. At approximately 84 hour interval an aliquot of the solution was removed and replaced with fresh well water. AD2 was maintained for the eight weeks of the experiment with no additions or subtractions.

Methane concentrations in the headspace and alkylphenol concentrations in the aqueous phase were determined by gas chromatography.

Test type: anaerobic.

GLP (Y/N): no.

Year study performed: 1983.

Contact time: 8 weeks.

Innoculum: Well water (Well P14) from a zone of active microbiological activity.

Concentration: 0.37 mg/l.

RESULTS

Percentage degradation:

Digestor AD1: 54% after 8 weeks

Digestor AD2: 0% after 8 weeks.

Some of the other phenols present (e.g. 3-methylphenol) did undergo significant degradation in both digestors.

CONCLUSIONS

Analysis of a third well (P119) located 430 m downgradient from Well W13 indicated that all the alkylphenols present in W13 underwent virtually complete anaerobic biodegradation after a sufficient time in the aquifer. The authors of the present study suggest that the design of the laboratory digestors may have inhibited complete biodegradation.

DATA QUALITY

Not a GLP study.

Adequate information is available regarding the experimental design and results. The latter confirm that alkylphenols have varying susceptibility to anaerobic biodegradation. The design of the laboratory digestors does not appear to model environmental processes adequately.

REFERENCES

Godsy, E.M. et al., Bull. Environ. Contam. Tox. 30, 261-268, (1983).

OTHER

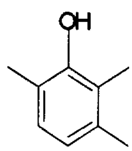
ECOTOXICITY ELEMENTS

10.1 ACUTE TOXICITY TO FISH

TEST SUBSTANCE

2,3,6-Trimethylphenol

CAS No. 2416-94-6



IUCLID Identification Number: 0675

METHOD

Bestimmung der Wirkung von Wasserinhaltsstoffen auf Fische, DIN 38412 Teil 15
Test type: Static
GLP: (N)
Year study performed: 1982

Species/strain: Freshwater fish, *Leuciscus idus*

RESULTS

NOEC 4.6 mg/l

LC0 (96hr) 10 mg/l

LC50 (96hr) 10-22 mg/l

LC100 (96hr) 21.5 mg/l

CONCLUSIONS

LC50 (96hr) value for 2,3,6-trimethyl phenol was found to be within the range of 10 to 22 mg/l.

DATA QUALITY

Information taken from IUCLID database.

Purity of the test substance: information not available in database.

GLP study: data not available.

REFERENCES

IUCLID Data Sheet

4. Ecotoxicity 4.1 Acute and Prolonged Toxicity to Fish

OTHER

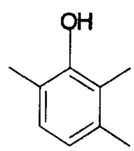
Study Ref.: BASF AG Ludwigshafen

10.2 ACUTE TOXICITY TO FISH

TEST SUBSTANCE

2,3,6-Trimethylphenol

CAS No. 2416-94-6



IUCLID Identification Number: 0675

METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Fish

Exposure period: 96 hours, 30 days and 90 days

RESULTS

LC50 (96hr) 3.9 mg/l

ChV (30 day) 0.58 mg/l

ChV (90 day) 0.050 mg/l

Remarks: log Kow used 3.15 (calculated value)

CONCLUSIONS

Estimated LC50 (96hr) for the test substance was found to be 3.9 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v.0.99e

OTHER

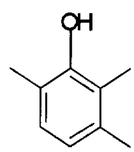
Calculation performed for this HPV submission.

11.1 TOXICITY TO AQUATIC PLANTS (E.G., ALGAE)

TEST SUBSTANCE

2,3,6-Trimethylphenol

CAS No. 2416-94-6



IUCLID Identification Number: 0675

METHOD

Scenedesmus-Zellvermehrungs-Hemmtest, DIN 38412 Teil 9, Bestimmung der Hemmwirkung von Wasserinhaltsstoffen auf Gruenalgen
Test type: Data not available
GLP: (N)
Year study performed: 1988

Species/strain: *Scenedesmus subspicatus*

RESULTS

EC20 (72hr) 15 mg/l

EC50 (72hr) 19 mg/l

EC90 (72hr) 24 mg/l

CONCLUSIONS

The EC50 (72hr) value for 2,3,6-trimethyl phenol was found to be 19 mg/l.

DATA QUALITY

Information taken from IUCLID database.

Purity of the test substance: information not available.

GLP study: data not available.

REFERENCES

IUCLID Data Sheet

4. Ecotoxicity 4.3 Toxicity to Aquatic Plants

OTHER

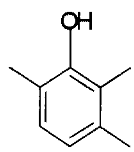
Study Ref.: BASF AG Ludwigshafen

11.2 TOXICITY TO AQUATIC PLANTS (E.G., ALGAE)

TEST SUBSTANCE

2,3,6-Trimethylphenol

CAS No. 2416-94-6



IUCLID Identification Number: 0675

METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Green algae

Exposure period: 96 hours

RESULTS

EC50 (96hr) 6.4 mg/l

ChV (96hr) 1.3 mg/l

Remarks: log Kow used 3.15 (calculated value)

CONCLUSIONS

Estimated EC50 (96hr) for the test substance was found to be 6.4 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v.0.99e

OTHER

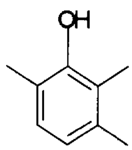
Calculation performed for this HPV submission.

12.1 ACUTE TOXICITY TO AQUATIC INVERTEBRATES (E.G., DAPHNIA)

TEST SUBSTANCE

2,3,6-Trimethylphenol

CAS No. 2416-94-6



IUCLID Identification Number: 0675

METHOD

Directive 88/449/EEC, Method C.2
Test type: Data not available
GLP: (N)
Year study performed: 1988

Species/strain: *Daphnia magna (Crustacea)*

RESULTS

EC0 (24hr) 6.25 mg/l

EC50 (24hr) 12.6 mg/l

EC100 (24hr) 25 mg/l

CONCLUSIONS

The EC50 (24hr) value for 2,3,6-trimethylphenol was found to be 12.6 mg/l.

DATA QUALITY

Information taken from IUCLID database.

Purity of the test substance: information not available.

GLP study: data not available.

REFERENCES

IUCLID Data base

4. Ecotoxicity 4.2 Acute Toxicity to Aquatic Invertebrates

OTHER

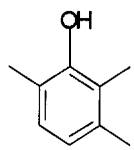
Study Ref.: BASF AG Ludwigshafen

12.2 ACUTE TOXICITY TO AQUATIC INVERTEBRATES (E.G., DAPHNIA)

TEST SUBSTANCE

2,3,6-Trimethylphenol

CAS No. 2416-94-6



IUCLID Identification Number: 0675

METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Daphnid

Exposure period: 48 hours, 21 days

RESULTS

LC50 (48hr) 2.5 mg/l

ChV (21day) 0.42 mg/l

Remarks: log Kow used 2.72 (calculated value)

CONCLUSIONS

Estimated LC50 (48hr) for the test substance was found to be 2.5 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v.0.99e

OTHER

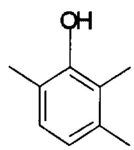
Calculation performed for this HPV submission.

12.3 ACUTE TOXICITY TO AQUATIC INVERTEBRATES (E.G., DAPHNIA)

TEST SUBSTANCE

2,3,6-Trimethylphenol

CAS No. 2416-94-6



IUCLID Identification Number: 0675

The substances used in this test were purchased from different commercial sources and were not purified before testing (all > 95% purity).

METHOD

AFNOR (1974) Acute Toxicity to *Daphnia magna*
Test type: Static
GLP: Data not available
Year study performed: 1987

Test substance preparation: The compounds were diluted with AFNOR (1974) reconstituted hard water for toxicity test (pH 7.8 –8.2; hardness, 200 mg/l expressed as $CaCO_3$). Phenol 2,3,6-trimethyl was dissolved directly in reconstituted water which had been aerated for 1 day prior to use. Acetone was used as dispersent-solvent at a maximum concentration of 0.1 ml/l of reconstituted water (ISO,1980). Five daphnids were placed into the test tube and reconstituted water added to make the volume up to 10 ml.

Species: *Daphnia magna* Straus 1820 used in this experiment came from the IRCHA Laboratory and had been cultured parthenogenetically in the Pasteur Institute Laboratory.

Analytical procedures: None

Test details: Twenty-four-hour IC50 values for three trimethylphenols, phenol, o-cresol, m-cresol, p-cresol and six xylenols were determined for *Daphnia magna* under static conditions.

Statistical methods: Percentages of immobilisation (between 10 and 90% on the basis of total number of *Daphnia* per concentration) were recorded and plotted as a function of concentration on log-probit paper. The points obtained were fitted to a straight line from which the IC50 was read as the abscissa of the point corresponding to 50% immobilisation. Each chemical was assayed in duplicate with a minimum of three replicates.

RESULTS

Single series of geometrically spaced concentrations were used (0.1, 0.35, 1, 3.5, 10, 35, 100 and 350 mg/l) in both the preliminary and the definitive tests.

Observations were made after 24 hour exposure. Daphnids that were unable to swim within 15 minutes after stimulation by gentle agitation of the water were considered to be immobilised. The 24-hour IC50 value to *Daphnia magna* for 2,3,6 trimethylphenol was found to be 0.143 mmol/l with the 95% confidence interval (0.130 – 0.155).

CONCLUSIONS

The results of this test showed that addition of a methyl group to phenol increases the toxicity compared with that registered to phenol.

DATA QUALITY

Information taken from the test report.

GLP study: data not available.

REFERENCES

Acute Toxicity of Cresols, Xylenols and Trimethylphenols to *Daphnia Magna* Straus 1820

OTHER

Study Ref.: The Science of the Total Environment, 76(1988) 79-83

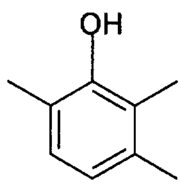
HEALTH ELEMENTS

13.1 ACUTE TOXICITY
ORAL

TEST SUBSTANCE

2,3,6-Trimethylphenol

CAS No. 2416-94-6



IUCLID Identification Number: 0675

METHOD

OECD Guideline No 401
GLP: (N)
Year study performed: 1986

Species/strain: Rat

Route of administration: Oral, gavage

RESULTS

LD50 >2000 mg/kg. Some mortality occurred at this dose level.

CONCLUSIONS

The LD50 of the test substance was found to be greater than 2000 mg/kg.

DATA QUALITY

Information taken from IUCLID database

Test performed to OECD guidelines but not GLP

REFERENCES

IUCLID Database

5.Toxicity, 5.1 Acute Toxicity, 5.1.1 Acute Oral Toxicity

OTHER

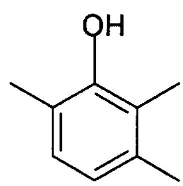
Study Ref: BASF AG Ludwigshafen

15.1 GENETIC TOXICITY IN VITRO (GENE MUTATIONS)

TEST SUBSTANCE

2,3,6-Trimethylphenol

CAS No. 2416-94-6



IUCLID Identification Number: 0675

METHOD

OECD Guideline No 471
The *Salmonella* Standard Plate Test (SPT) and Preincubation Test (PIT)
GLP: (N)
Year study performed: 1983

Species/strain: *Salmonella typhimurium* TA 1535, TA1537, TA 100 & TA 98

Concentrations tested:

Standard Plate Test

20-5000 µg/plate TA100, TA 98; 4-2500 µg/plate TA 1535, TA 1537

Preincubation Test: 4-5000 µg/plate all tester strains

With and without S-9 metabolic activation

RESULTS

Negative

CONCLUSIONS

The test material is not genetically active in the Ames *Salmonella typhimurium* assay In the presence or absence of S-9 metabolic activation.

DATA QUALITY

Information taken from IUCLID database

Test performed to OECD guidelines but not GLP

REFERENCES

IUCLID Database

5. Toxicity 5.5 Genetic Toxicity *in Vitro*

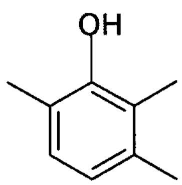
OTHER

Study Ref: BASF AG Ludwigshafen

15.2 GENETIC TOXICITY IN VITRO (GENE MUTATIONS)

TEST SUBSTANCE

2,3,6-Trimethylphenol



CAS No. 2416-94-6

IUCLID Identification Number: 0675

METHOD

OECD Guideline No 471
GLP: (Y)
Year study performed: 1987

Species/strain: *Salmonella typhimurium,* TA 1535, TA1537, TA100 & TA 98

Concentrations tested: 0-1500 µg/plate all tester strains

With and without S-9 metabolic activation

RESULTS

Negative

CONCLUSIONS

The test material is not genetically active in the Ames *Salmonella typhimurium* assay In the presence or absence of S-9 metabolic activation.

DATA QUALITY

Information taken from IUCLID database.

Test performed to OECD guidelines and to GLP.

REFERENCES

IUCLID Database

5. Toxicity 5.5 Genetic Toxicity *in Vitro*

OTHER

Study Ref: BASF AG Ludwigshafen

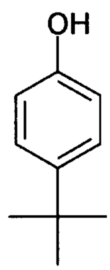
PHYSICAL/CHEMICAL ELEMENTS

1.1 MELTING POINT

TEST SUBSTANCE

p-tert-Butylphenol

CAS No. 98-54-4



METHOD

Method/guideline followed: information not available in database.

GLP (Y/N): No

Year study performed: 1992

RESULTS

Melting point: ca. 100°C.

CONCLUSIONS

The test substance has a melting point of ca. 100°C.

DATA QUALITY

Not a GLP study.

Information taken from IUCLID database.

Purity of the test substance / decomposition: information not available in database.

REFERENCES

Sicherheitsdatenblatt Huels AG, 28.04.92 as cited in IUCLID database.

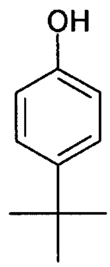
OTHER

2.1 BOILING POINT

TEST SUBSTANCE

p-tert-Butylphenol

CAS No. 98-54-4



METHOD

Method/guideline followed: information not available in database.

GLP (Y/N): no.

Year study performed: 1992.

RESULTS

Boiling point: 237°C at 101325 Pa (760 mm Hg).

CONCLUSIONS

The test substance has a boiling point of 237°C.

DATA QUALITY

Not a GLP study.

Information taken from IUCLID database.

Purity of the test substance / decomposition: information not available in database.

REFERENCES

Sicherheitsdatenblatt Huels AG, 28.04.92 as cited in IUCLID database.

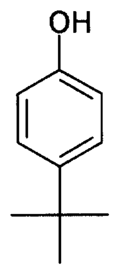
OTHER

3.1 VAPOUR PRESSURE

TEST SUBSTANCE

p-tert-Butylphenol

CAS No. 98-54-4



METHOD

Method/guideline followed: information not available in database.

GLP (Y/N): no.

Year study performed: 1994.

RESULTS

Vapour pressure: 0.5 Pa at 20°C.

CONCLUSIONS

The test substance has a vapour pressure of 0.5 Pa at 20°C.

DATA QUALITY

Not a GLP study.

Information taken from IUCLID database.

Purity of the test substance / decomposition: information not available in database.

REFERENCES

Huels AG: Produktinformation "p-ter.-Butylphenol", Art.-Nr.: 001786; Ausgabe 01.08.1994 as cited in IUCLID database.

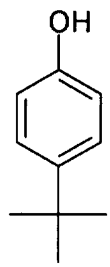
OTHER

4.1.PARTITION COEFFICIENT

TEST SUBSTANCE

p-tert-Butylphenol

CAS No. 98-54-4



METHOD

Method/guideline followed: flask-shake method.

GLP (Y/N): no.

Year study performed: not known.

RESULTS

Log Kow: 3.31.

CONCLUSIONS

The test substance has a log Kow of 3.31.

DATA QUALITY

Not a GLP study.

Information taken from IUCLID database.

Purity of the test substance: information not available in database.

The flask-shake method is an acceptable technique and is described in EU, OECD and OPPTS test guidelines.

REFERENCES

Church, C., Hansch, C.: unpublished results cited in: Leo, A. et al. (1971): Chem. Rev. 71, 531, 537 – 538, 551, 555, 593. Cited in IUCLID database.

OTHER

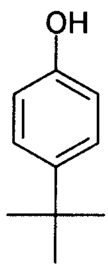
p-tert-Butylphenol has a pKa value of 10.39 (Serjeant, E.P., Dempsey, B. (1979) (Ionization Constants of Organic Acids in aqueous Solution, Pergamon, N.Y. as cited in the IUCLID database.)

5.1. WATER SOLUBILITY

TEST SUBSTANCE

p-tert-Butylphenol

CAS No. 98-54-4



METHOD

Method/guideline followed: information not available in database.

GLP (Y/N): no.

Year study performed: 1990.

RESULTS

Water solubility: 0.8 g/l at 20 °C.

CONCLUSIONS

The water solubility of the test substance is 0.8 g/l at 20 °C.

DATA QUALITY

Not a GLP study.

Information taken from IUCLID database.

Purity of the test substance: information not available in database.

REFERENCES

Boeddeker, K.W. et al. (1990): J. Membr. Sci. 53, 143 – 158 as cited in IUCLID database.

OTHER

p-tert-Butylphenol has a pKa value of 10.39 (Serjeant, E.P., Dempsey, B. (1979) (Ionization Constants of Organic Acids in aqueous Solution, Pergamon, N.Y. as cited in the IUCLID database.)

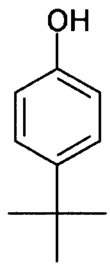
ENVIRONMENTAL FATE AND PATHWAY ELEMENTS

6.1 PHOTODEGRADATION

TEST SUBSTANCE

p-tert-Butylphenol

CAS No. 98-54-4



METHOD

Method/guideline followed: calculation using the programme AOPWIN v1.88.

Test type: calculation of the rate constant for the atmospheric reaction between photochemically produced hydroxyl radicals and the test substance in the vapour phase.

GLP (Y/N): no.

Year study performed: calculation made for this HPV submission.

RESULTS

Sensitizer: hydroxyl radical.

Overall hydroxyl rate constant: 40.6×10^{-12} cm^3/molecule-sec.

Half-life: 3.16 hours.

CONCLUSIONS

The programme estimates that in a typical atmosphere 50% of the test substance will undergo reaction in 3.16 hours.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. AOPWIN v 1.88.

OTHER

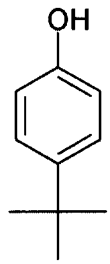
Direct aqueous photolysis: *p*-cresol in aqueous solution is reported as having a half-life of 35 days in sunlight (Smith, J.H. et al, "Environmental Pathways of Selected Chemicals in Freshwater Systems: Part II. Laboratory Studies," EPA-600/7-78-074, May 1978. Cited in Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, page 8-38.

7.1 STABILITY IN WATER

TEST SUBSTANCE

p-tert-Butylphenol

CAS No. 98-54-4



COMMENT

No abiotic hydrolysis studies were located.

The category phenols do not possess any functional groups that are regarded as being susceptible to hydrolysis under environmental conditions (Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, pages 7-4 and 7-5).

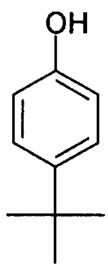
The software prediction programme HYDROWIN v1.66 cannot estimate hydrolysis rate constants for phenols.

8.1 TRANSPORT BETWEEN ENVIRONMENTAL COMPARTMENTS (FUGACITY)

TEST SUBSTANCE

p-tert-Butylphenol

CAS No. 98-54-4



METHOD

Test type: Calculation of partitioning between environmental compartments.

Year study performed: calculation made for this HPV submission.

Model: Level 1 Fugacity-Based Environmental Partitioning Model v2.11.

Input values

Chemical specific

Molecular mass:	150
Data temperature (°C):	25
Water solubility (mg/l):	800
Vapour pressure (Pa):	0.50
Log Kow:	3.31
Melting point (C):	100

Environmental conditions: defaults used

RESULTS

Environmental compartment	Percentage of test substance
Air	0.66
Soil	63.0
Water	34.9
suspended sediment	0.044
fish	0.0036
Sediment	1.40

DATA QUALITY

The Mackay Level I Fugacity Model estimates the equilibrium distribution of a fixed quantity of a non-reacting chemical in a closed environment at equilibrium; with no degradation reactions and no flow or intermedia transport processes. The chemical is assumed to distribute instantaneously to an equilibrium concentration and therefore the medium receiving the emission is unimportant. This model is an aid to understanding the physical chemistry properties that are of greatest importance in determining the environmental distribution of substances; it is not a tool to predict actual or likely concentrations in a real environment.

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 and therefore their physical chemistry properties are unlikely to be affected by the pH values normally found in the environment.

REFERENCES

This software program is available with the publication: Mackay, D., Multimedia environmental models: the fugacity approach, Lewis Publishers Inc., Chelsea, MI, 1991.

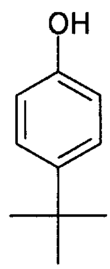
OTHER

9.1 BIODEGRADATION

TEST SUBSTANCE

p-tert-Butylphenol

CAS No. 98-54-4



METHOD

Method/guideline followed: Directive EEC/92/69, Part II, C. 4-A DOC Die Away Test

Test type: aerobic

GLP (Y/N): yes

Year study performed: 1992

Contact time: 28 days.

Innoculum: non-adapted, domestic, activated sludge.

Concentration: 10 mg/l (related to DOC).

RESULTS

Percentage degradation: 98% after 28 days

CONCLUSIONS

The test substance was readily biodegradable under the conditions of the test.

DATA QUALITY

GLP study.

The test concentration was well within the water solubility of *p-tert*-butylphenol.

REFERENCES

Huels report No. DDA-59, 1994 (unpublished) as cited in IUCLID database.

OTHER

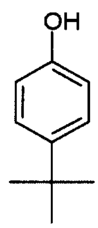
ECOTOXICITY ELEMENTS

10.1 ACUTE TOXICITY TO FISH

TEST SUBSTANCE

p- tert-butylphenol

CAS No. 98-54-4



IUCLID Identification Number: 98-54-4

Purity of the test substance given as 99%.

METHOD

Acute Toxicity Test, based on US EPA procedures
Test type: Flow through toxicity test
GLP: Data not available
Year study performed: 1975

Species: Freshwater fish - *Pimephales promelas*

Fish used for the test were 31 to 35 days old.

Analytical monitoring: Yes, no details available on IUCLID.

Exposure period: 96 hours

Test conditions:

Temperature:	24.6 ± 1.4°C
pH	6.9 – 7.7
Dissolved oxygen:	4.6 – 8.8 mg O_2/l
Hardness ($CaCO_3$):	42.2 – 46.6 mg/l

RESULTS

LC50 (24hr) 6.21 mg/l

LC50 (48hr) 5.69 mg/l

LC50 (72hr) 5.26 mg/l

LC50 (96hr) 5.14 mg/l

Remarks: 5.44 mg/l caused some cases of spinal deformities; at 3.10 mg/l some fish were narcotised (no reaction to tapping the outside of the tank).

CONCLUSIONS

The LC50 (96hr) of the test substance is 5.14 mg/l.

DATA QUALITY

Information taken from IUCLID database.

GLP study: data not available.

REFERENCES

IUCLID Data Sheet

4.1 Acute/Prolonged Toxicity to Fish

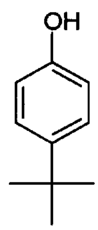
Study Ref.: Huels AG Marl

10.2 ACUTE TOXICITY TO FISH

TEST SUBSTANCE

p- tert-butylphenol

CAS No. 98-54-4



IUCLID Identification Number: 98-54-4

METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Fish

Exposure period: 96 hours, 30 days and 90 days

RESULTS

LC50 (96hr) 2.9 mg/l

ChV(30 day) 0.43 mg/l

ChV (90 day) 0.041 mg/l

Remark: log Kow used 3.42 (calculated value)

CONCLUSIONS

Estimated LC50 (96hr) for the test substance was found to be 2.9 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v.0.99e

OTHER

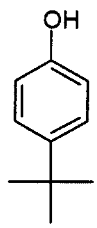
Calculation performed for this HPV submission.

11.1 TOXICITY TO AQUATIC PLANTS (E.G., ALGAE)

TEST SUBSTANCE

p- tert-butylphenol

CAS No. 98-54-4



IUCLID Identification Number: 98-54-4

Purity of the test substance: information not available. Recrystallized before testing.

METHOD

Algal Growth Inhibition Test
Test type: Data not available
GLP: Data not available
Year study performed: 1971

Species: *Chlorella vulgaris*

Analytical monitoring: No data

Exposure period: 6 hours

Test conditions:

Temperature: 36.5°C

RESULTS

EC50 (6hr) 22.2 – 34.4 mg/l

Remarks: The EC50 value depended on the method of biomass determination:

photometric extinction at 680 nm: EC50 = 22.2 mg/l

photometric extinction at 750 nm: EC50 = 34.4 mg/l

CONCLUSIONS

The EC50 (6hr) of the test substance was found to be 22.2 mg/l (at 680 nm) and 34.4 mg/ (at 750 nm).

DATA QUALITY

Information taken from IUCLID database.

Purity of the test substance: information not available.

GLP study: data not available

REFERENCES

IUCLID Data Sheet

4.3 Toxicity to Aquatic Plants e.g. Algae

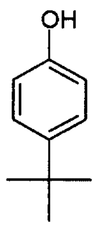
Study Ref.: Huels AG Marl

11.2 TOXICITY TO AQUATIC PLANTS (E.G., ALGAE)

TEST SUBSTANCE

p- tert-butylphenol

CAS No. 98-54-4



IUCLID Identification Number: 98-54-4

METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Green algae

Exposure period: 96 hours

RESULTS

EC50 (96hr) 4.1 mg/l

ChV (96hr) 0.94 mg/l

Remark: log Kow used 3.42 (calculated value)

CONCLUSIONS

Estimated EC50 (96hr) for the test substance was found to be 4.1 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v.0.99e

OTHER

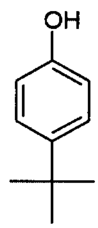
Calculation performed for this HPV submission.

12.1 ACUTE TOXICITY TO AQUATIC INVERTEBRATES (E.G., DAPHNIA)

TEST SUBSTANCE

p- tert-butylphenol

CAS No. 98-54-4



IUCLID Identification Number: 98-54-4

Purity of the test substance: information not available.

METHOD

Daphnien- Kurzzeittest, DIN 38412 Teil 11, bestimmung der Wirkung von Wasserinhaltsstoffen auf Kleinkrebse
Test type: Data not available
GLP: Data not available
Year study performed: 1982

Species: *Daphnia magna* (*Crustacea)*

Analytical monitoring: No data

Exposure period: 48 hours

Test conditions:

Temperature: 20°C

pH: 8.0 ± 0.2

Total hardness: 2.4 mmol/l

(Ca/Mg ratio = 4:1, Na/K ratio = 10:1)

RESULTS

EC0 (48hr) 2.6 mg/l

EC50 (48hr) 3.9 mg/l

EC100 (48hr) 7.1 mg/l

CONCLUSIONS

The EC50 (48hr) of the test substance is 3.9 mg/l.

DATA QUALITY

Information taken from IUCLID database.

Purity of the test substance: information not available.

GLP study: data not available.

REFERENCES

IUCLID Data Sheet

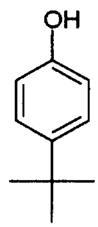
4.2 Acute Toxicity to Aquatic Invertebrates

Study Ref.: Huels AG Marl

12.2 ACUTE TOXICITY TO AQUATIC INVERTEBRATES (E.G., DAPHNIA)

TEST SUBSTANCE

p- tert-butylphenol



CAS No. 98-54-4

IUCLID Identification Number: 98-54-4

METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Daphnid

Exposure period: 48 hours, 21 days

RESULTS

LC50 (48hr) 2.1 mg/l

ChV (21day) 0.32 mg/l

Remark: log Kow used 3.42 (calculated value)

CONCLUSIONS

Estimated LC50 (48hr) for the test substance was found to be 2.1 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v. 0.99e

OTHER

Calculation performed for this HPV submission.

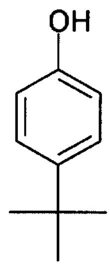
HEALTH ELEMENTS

13.1 ACUTE TOXICITY
ORAL

TEST SUBSTANCE

p-tert-Butylphenol

CAS No. 98-54-4



IUCLID ID Number 98-54-4

METHOD

EEC Directive 67/548 Method B1; OECD Guidelines No. 401
GLP: (Y)
Year study performed: 1991

Species: Sprague-Dawley rats

No. of animals per sex per dose: 10 (five male and five female),

Vehicle: Arachis oil B.P.

Route of administration: Oral gavage

Dose level: 2000 mg/kg

10 rats were given a single oral dose of test material as a solution/suspension at a dose level of 2000 mg/kg.

RESULTS

There were no deaths and no signs of systemic toxicity during the study. No abnormalities were noted at necropsy.

LD50 >2000 mg/kg

CONCLUSIONS

Essentially nontoxic. No symbol and risk phrases are required according to EEC labelling regulations.

DATA QUALITY

The study was performed to OECD guidelines and GLP.

REFERENCES

Range-finding acute oral toxicity test in the rat Project Number 47/1596, Sandoz Chemicals Test Report. Issued by Safepharm Laboratories, P.O Box No45, Derby, DE1 2BT, U.K.

OTHER

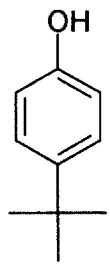
There are data for 6 other acute oral toxicity study mentioned in the IUCLID database. These all give a value for LD_{50} of between 2990 and 5360 mg/kg.

13.2 ACUTE TOXICITY
INHALATION

TEST SUBSTANCE

p-tert-Butylphenol

CAS No. 98-54-4



IUCLID ID Number 98-54-4

METHOD

Method: Not specified
Type: Static exposure to substantially saturated vapour
GLP: No data
Year study performed: 1988

Species: Rats

Exposure time: 6 hours

100 g of test substance was placed in a 120 l chamber for ca. 18 hours at ambient temperature prior to the introduction of the rats.

RESULTS

No effects on body weight, clinical signs, mortality or necropsy observations were found.

CONCLUSION

No effect in rats from exposure to saturated vapour of test substance.

DATA QUALITY

Information from IUCLID database

No data for GLP

REFERENCES

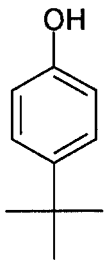
IUCLID Dataset created by European COMMISSION-European Chemicals Bureau Created 19 Feb 2000

13.3 ACUTE TOXICITY
SKIN IRRITATION

TEST SUBSTANCE

p-tert-Butylphenol

CAS No. 98-54-4



IUCLID ID Number 98-54-4

METHOD

Method: OECD Guidelines No. 404; EEC Directive 84/449 Method B4
Type: Acute Dermal Irritation/Corrosion
GLP: (Y)
Year study performed: 1991

Species: New Zealand White rabbit

No. of animals per sex per dose: 3

Vehicle: Test substance was moistened with distilled water

Route of administration: Semi-occluded application to intact skin.

Exposure time: 4 hours

Dose level: 0.5 g

RESULTS

Severe irritant to rabbit skin according to the Draize classification scheme.

Slight to well-defined erythema was noted at all treated skin sites one hour after patch removal and persisted for at least 24 hours.

CONCLUSION

The symbol "Xi" and risk phrase R38 "irritating to skin" are therefore required.

DATA QUALITY

Study performed to OECD guidelines and GLP.

REFERENCES

Acute Dermal Irritation Test in the rabbit - Project Number: 47/1597

SafePharm Laboratories Limited, P.O Box No 45, Derby, DE1 2BT, U.K.

OTHER

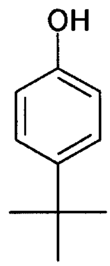
A paper in Drug and Chemical Toxicology, 11(10, 43-54 (1988) entitled "Acute Toxicity and Primary Irritation of Para-Tertiary Butylphenol", examined Peroral, percutaneous inhalation toxicity and skin and eye irritation. The main conclusion from this paper was acute exposure to the test substance is associated with persistent ocular injury, and to a lesser extent, from dermal contact.

15.1 GENETIC TOXICITY IN VITRO (CHROMOSOMAL ABERRATIONS)

TEST SUBSTANCE

p-tert-Butylphenol

CAS No. 98-54-4



IUCLID ID Number 98-54-4

METHOD

Dean and Hodson-Walker 1979
Type: Chromosome aberration assay
GLP: (N)
Year study performed: 1984

Species/strain: Rat liver cells grown on microscope slides contained in petri dishes. Positive controls included. Chromosome preparations made and 100 cells from each culture were analysed.

Metabolic activation: No

Exposure period: 24 hours

Concentrations tested: 0.5, 0.25 and 0.125 of the GI^{50} (50% growth inhibition)

RESULTS

No evidence of mutagenic activity

CONCLUSIONS

Test substance was considered to be non mutagenic in this test system.

DATA QUALITY

Not performed to GLP.

Not a recognised test method.

No metabolic activation used.

REFERENCES

Mutation Research, 153 (1985) 57-77

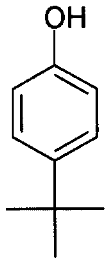
Genetic toxicology testing of 41 industrial chemicals.

15.2 GENETIC TOXICITY IN VITRO (GENE MUTATION ASSAY)

TEST SUBSTANCE

p-tert-Butylphenol

CAS No. 98-54-4



IUCLID ID Number 98-54-4

METHOD

Method: Ames et al (1975)
Type: Reverse mutation assay, Bacterial - Plate incorporation and preincubation methods used
GLP: (N)
Year study performed: 1980

Species/strain: *Salmonella typhimurium* TA 1535, TA 1537, TA 1538, TA 98 and TA 100 and E.coli WP_2 and WP_2uvrA

Metabolic activation: S-9 mix (with and without).

Concentrations tested:

Dose/concentration without S-9 mix: 125, 250, 500, 1000, 2000 and 4000 µg/plate

Dose/concentration with S-9 mix: 125, 250, 500, 1000, 2000 and 4000 µg/plate

Triplicate plating.

RESULTS

The test substance did not cause any mutations in either test system.

CONCLUSIONS

Test substance is considered to be non mutagenic.

DATA QUALITY

Not performed to GLP, but a recognised test method.

REFERENCES

Mutation Research, 153 (1985) 57-77

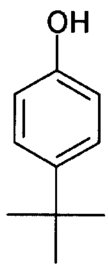
Genetic toxicology testing of 41 industrial chemicals.

15.3 GENETIC TOXICITY IN VITRO (GENE MUTATION ASSAY)

TEST SUBSTANCE

p-tert-Butylphenol

CAS No. 98-54-4



IUCLID ID Number 98-54-4

METHOD

Method: Honma et al 1998
Type: Gene mutation assay- Mouse lymphoma
GLP: (N)
Year study performed: 1999

Species/strain: L5178y tk+/- clone, mouse lymphoma cells

Metabolic activation: No

Concentrations tested:

Dose/concentration without S-9 mix: 10, 20, 30, 40, 50, 60, 70 and 80 μg/ml

Dose/concentration with S-9 mix: N/A

Exposure time: 3 and 24 hours. This study was undertaken to validate the mouse lymphoma assay as an alternative to the chromosome assay, and therefore included a later harvest time.

RESULTS

No evidence of mutagenic response after 3 hours treatment (normal exposure time). Although positive response seen at 24 hour treatment this data is not relevant as only used as a demonstration.

CONCLUSIONS

Test substance is considered to be non mutagenic after the normal 3 hour treatment time in the absence of S9 mix.

DATA QUALITY

Not performed to GLP and not tested in the presence of metabolic activation.

REFERENCES

Mutagenesis vol. 14 no 1 pp 23-29, 1999

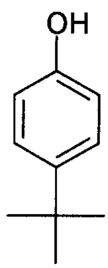
The need for long-term treatment in the mouse lymphoma assay.

16.1 REPEATED DOSE TOXICITY
20 WEEKS DIETARY

TEST SUBSTANCE

p-tert-Butylphenol

CAS No. 98-54-4



METHOD

Study design: 20 week dietary study, non-Guideline, on 13 phenolic compounds	
GLP: No information	
Year study performed: 1986	

Species and sex: Male Syrian Golden Hamster, 6 weeks of age at start, in groups of 15

Route of administration: Oral, by incorporation in feed

Exposure period: Continuous for 20 weeks

Dose: 15 000 ppm. Dosage was based on one quarter of the LD50 value determined for rats.

Liver and kidneys weighed, preserved with cheek pouch, stomach, oesophagus, lung, pancreas and urinary bladder. These tissues examined histologically. Autoradiography performed for stomach and bladder tissue, labelling increased DNA synthesis with ^{3}H-thymidine and thus identifying dividing cells.

RESULTS (for PTPB)

Average body weight at the end of the study was 5% less than that of the control group. Average liver weight (relative to body weight) was increased by 21%.

Prominent thickening of the forestomach epithelium with a keratin-like white substance observed in the posterior and anterior walls along the lesser curvature and adjacent to the oesophagus.

Chemical	No. of hamsters	Body wt (g)	Liver wt. (g/100g body wt)	No. of hamsters (%) with:			
				Mild hyperplasia	Moderate hyperplasia	Severe hyperplasia	Papillo-matous lesions
PTBP	15	192 ± 14	4.6 ± 0.4	15 (100) ***	12 (80) ***	11 (73.3)***	7 (46.7) ***
Basal diet	15	203 ± 23	3.8 ± 0.4	7 (46.7)	1 (6.7)	0	0

***P < 0.001; ** P < 0.01; *P< 0.05

No abnormal findings were observed in liver, kidneys, cheek pouch, lung, pancreas and urinary bladder.

Chemical	No. of hamsters	Labelling index (Mean ± SD of labelled cells/100 cells)		
		Forestomach	Pyloric region	Urinary bladder
PTBP	3	34.3 ± 6.4 **	10.7 ± 0.4	0.13 ± 0.06
Basal diet	3	12.5 ± 4.7	7.3 ± 1.9	0.08 ± 0.14

** P < 0.01; *P< 0.05

CONCLUSION

PTBP may have carcinogenic effects on the forestomach of hamsters. The significance of the findings (in a structure that does not occur in humans) for human cancer hazard is not known.

DATA QUALITY

No information to confirm if this was a GLP study.

REFERENCE

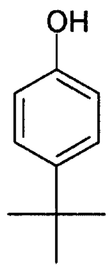
Hirose, M. et al. (1986) Carcinogenesis 7, 1285-1289

16.2 REPEATED DOSE TOXICITY
51 WEEKS CARCINOGENICITY DIETARY

TEST SUBSTANCE

p-tert-Butylphenol

CAS No. 98-54-4



IUCLID ID Number 98-54-4

METHOD

Method: Other, not specified
Type: 51 weeks
GLP: No data
Year study performed: 1988

Species and sex: Male Fischer 344 rats

Route of admin: Oral feed

Exposure period: 51 weeks

Post observation period: 1 week

Doses: 15000 ppm

Control group: Yes, concurrent no treatment

RESULTS

Carcinogenicity: Average body weights and relative weights were decreased significantly ($p<0.001$): relative kidney weights were significantly increased; histological changes in the forestomach.

Hyperplasia: 14/15 rats, control 0/10

Papilloma: 1/15, control 0/10

Carcinoma within hyperplastic epithelium without invasion of the submucosa (carcinoma "in situ") 0/15, control 0/15

Squamous cell carcinoma: 0/15, control 0/15

No hyperplasia or carcinoma found in the glandular stomach, and no tumours seen in oesophagus, liver kidneys or intestines.

Modifying effect of 4-tert-butylphenol on N-Methyl-N''-nitro-N-nitrosoguanidine (MNNG)- induced forestomach and glandular stomach carcinogenesis:

At 6 weeks of age, the animals were given 150 mg/kg bw MNNG in saline by stomach tube; one week later rats were treated. Animals, which were treated with MNNG, followed by basal diet served as controls.

Average body weight decreased significantly, and relative liver and kidney weights increased significantly.

Histological changes in the forestomach:

Hyperplasia: 20/20 rats, control 19/19

Papilloma: 19/29 rats, control 13/19

Carcinoma "in situ": 8/20, control 11/19

Squamous cell carcinoma: 15/20 rats ($p<0.01$) control 5/19

Leiomyosarcoma induced in one rat: no tumours seen in other organs.

CONCLUSION

Test substance has a very weak or lacks carcinogenic activity, but enhances forestomach carcinogenesis in rats treated with MNNG.

DATA QUALITY

Information taken from IUCLID database. "The data in this summary is supportive rather than key information".

No data to confirm if GLP

REFERENCES

Huels Ag Marl

Hirose, M et al (1988): Cancer Res. 48, 5310-5315

IUCLID Dataset created by European COMMISSION-European Chemicals Bureau Created 19 Feb 2000

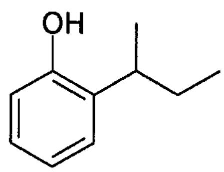
PHYSICAL/CHEMICAL ELEMENTS

1.1 MELTING POINT

TEST SUBSTANCE

o-sec-Butylphenol

CAS No. 89-72-5



METHOD

Method/guideline followed: information not available in database.

GLP (Y/N): No.

Year study performed: not known.

RESULTS

Melting point: 14°C.

CONCLUSIONS

The test substance has a melting point 14°C.

DATA QUALITY

Not a GLP study.

Information taken from a literature search covering appropriate databases.

Purity of the test substance / decomposition: information not available.

REFERENCES

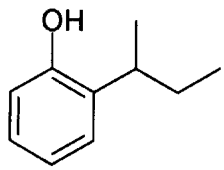
Ashford, R.D. Ashford's Dictionary of Industrial Chemicals. London, England: Wavelength Publications Ltd., 1994, p. 159.

OTHER

2.1 BOILING POINT

TEST SUBSTANCE

o-sec-Butylphenol



CAS No. 89-72-5

METHOD

Method/guideline followed: Schenectady International Inc. internal procedure.

GLP (Y/N): no.

Year study performed: 1993.

RESULTS

Boiling point: 224°C @ 760 mm Hg.

CONCLUSIONS

The test substance has a boiling point of 224°C.

DATA QUALITY

Not a GLP study.

Information taken from a technical datasheet.

Purity of the test substance given as typically 98.5 % minimum.

Decomposition: information not available.

REFERENCES

Schenectady International inc. Technical Datasheet (11/93).

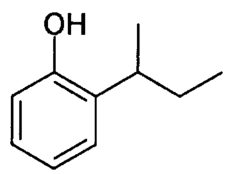
OTHER

3.1 VAPOUR PRESSURE

TEST SUBSTANCE

o-sec-Butylphenol

CAS No. 89-72-5



METHOD

Method/guideline followed: calculation.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Vapour pressure: 0.0173 mm Hg @ 25°C (2.31 Pa).

CONCLUSIONS

The test substance has a calculated vapour pressure of 0.0173 mm Hg @ 25°C.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. MPBPWIN v 1

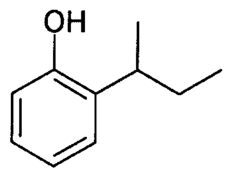
OTHER

4.1 PARTITION COEFFICIENT

TEST SUBSTANCE

o-sec-Butylphenol

CAS No. 89-72-5



METHOD

Method/guideline followed: calculation.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Log Kow: 3.46 at 25°C.

CONCLUSIONS

The test substance has a calculated log Kow of 3.46 at 25°C.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. KOWWIN v 1.63

OTHER

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 (Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994).

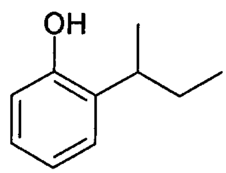
KOWWIN reported an experimental log Kow of 3.27 in its database (Hansch & Leo, 1985).

5.1 WATER SOLUBILITY

TEST SUBSTANCE

o-sec-Butylphenol

CAS No. 89-72-5



METHOD

Method/guideline followed: calculation using a log Kow value of 3.46.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Water solubility: 319 mg/l @ 25°C

CONCLUSIONS

The water solubility of the test substance is 319 mg/l @ 25°C.

DATA QUALITY

Calculation.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. WSKOW v1.33.

OTHER

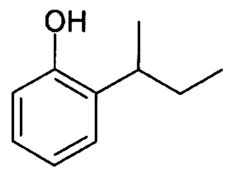
Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 (Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994).

ENVIRONMENTAL FATE AND PATHWAY ELEMENTS

6.1 PHOTODEGRADATION

TEST SUBSTANCE

o-sec-Butylphenol



CAS No. 89-72-5

METHOD

Method/guideline followed: calculation using the programme AOPWIN v1.88.

Test type: calculation of the rate constant for the atmospheric reaction between photochemically produced hydroxyl radicals and the test substance in the vapour phase.

GLP (Y/N): no.

Year study performed: calculation made for this HPV submission.

RESULTS

Sensitizer: hydroxyl radical.

Overall hydroxyl rate constant: 44.1×10^{-12} cm^3/molecule-sec.

Half-life: 2.91 hours.

CONCLUSIONS

The programme estimates that in a typical atmosphere 50% of the test substance will undergo reaction in 2.91 hours.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. AOPWIN v 1.88.

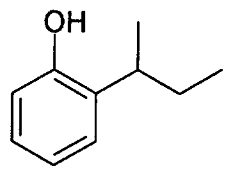
OTHER

No experimental data was found on direct aqueous photolysis of the test substance. However, *p*-cresol, a related substance, in aqueous solution is reported as having a half-life of 35 days in sunlight (Smith, J.H. et al, "Environmental Pathways of Selected Chemicals in Freshwater Systems: Part II. Laboratory Studies," EPA-600/7-78-074, May 1978. Cited in Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, page 8-38.

7.1 STABILITY IN WATER

TEST SUBSTANCE

o-sec-Butylphenol



CAS No. 89-72-5

COMMENT

No abiotic hydrolysis studies were located.

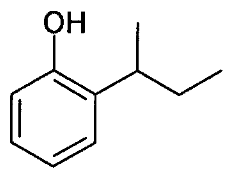
The category phenols do not possess any functional groups that are regarded as being susceptible to hydrolysis under environmental conditions (Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, pages 7-4 and 7-5).

The software prediction programme HYDROWIN v1.66 cannot estimate hydrolysis rate constants for phenols.

8.1 TRANSPORT BETWEEN ENVIRONMENTAL COMPARTMENTS (FUGACITY)

TEST SUBSTANCE

o-sec-Butylphenol



CAS No. 89-72-5

METHOD

Test type: Calculation of partitioning between environmental compartments.

Year study performed: Model run for this HPV submission.

Model: Level 1 Fugacity-Based Environmental Partitioning Model v2.11.

Input values

Chemical specific

Molecular mass:	150
Data temperature (°C):	25
Water solubility (mg/l):	319
Vapour pressure (Pa):	2.31
Log Kow:	3.27
Melting point (°C):	14

Environmental conditions: defaults used.

RESULTS

Environmental compartment	Percentage of test substance
Air	7.54
Soil	56.7
Water	34.4
suspended sediment	0.039
fish	0.0032
Sediment	1.26

DATA QUALITY

The Mackay Level I Fugacity Model estimates the equilibrium distribution of a fixed quantity of a non-reacting chemical in a closed environment at equilibrium; with no degradation reactions and no flow or intermedia transport processes. The chemical is assumed to distribute instantaneously to an equilibrium concentration and therefore the medium receiving the emission is unimportant. This model is an aid to understanding the physical chemistry properties that are of greatest importance in determining the environmental distribution of substances; it is not a tool to predict actual or likely concentrations in a real environment.

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 and therefore their physical chemistry properties are unlikely to be affected by the pH values normally found in the environment.

REFERENCES

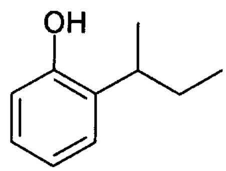
This software program is available with the publication: Mackay, D., Multimedia environmental models: the fugacity approach, Lewis Publishers Inc., Chelsea, MI, 1991.

OTHER

9.1 BIODEGRADATION

TEST SUBSTANCE

o-sec-Butylphenol



CAS No. 89-72-5

METHOD

Method/guideline followed: calculation using the programme BIOWIN v3.65.

Test type: calculation of the probability for rapid aerobic biodegradation of the test substance in the presence of mixed populations of environmental microorganisms.

GLP (Y/N): no.

Year study performed: calculation made for this HPV submission.

RESULTS & CONCLUSIONS

The program predicts:

Primary biodegradation in days/weeks

Ultimate biodegradation in weeks.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. BIOWIN v 3.65.

OTHER

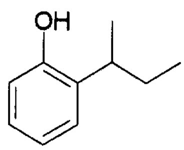
ECOTOXICITY ELEMENTS

10.1 ACUTE TOXICITY TO FISH

TEST SUBSTANCE

o-sec-Butylphenol

CAS No. 89-72-5



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Fish

Exposure period: 96 hours, 30 days and 90 days

RESULTS

LC50 (96hr) 2.78 mg/l

ChV (30 day) 0.41 mg/l

ChV (90 day) 0.040 mg/l

Remark: log Kow used 3.46 (calculated value)

CONCLUSIONS

Estimated LC50 (96hr) for the test substance was found to be 2.78 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v.0.99e

OTHER

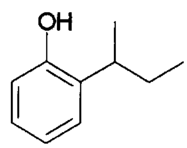
Calculation performed for this HPV submission.

11.1 TOXICITY TO AQUATIC PLANTS (E.G., ALGAE)

TEST SUBSTANCE

o-sec-Butylphenol

CAS No. 89-72-5



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Green algae

Exposure period: 96 hours

RESULTS

EC50 (96hr) 3.81 mg/l

ChV (96hr) 0.89 mg/l

Remark: log Kow used 3.46 (calculated value

CONCLUSIONS

Estimated EC50 (96hr) for the test substance was found to be 3.81 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v.0.99e

OTHER

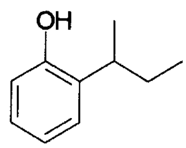
Calculation performed for this HPV submission.

12.1 ACUTE TOXICITY TO AQUATIC INVERTEBRATES (E.G., DAPHNIA)

TEST SUBSTANCE

o-sec-Butylphenol

CAS No. 89-72-5



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Daphnid

Exposure period: 48 hours, 21 days

RESULTS

LC50 (48hr) 2.0 mg/l

ChV (21day) 0.30 mg/l

Remark: log Kow used 3.46 (calculated value)

CONCLUSIONS

Estimated LC50 (48hr) for the test substance was found to be 2.0 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v. 0.99e

OTHER

Calculation performed for this HPV submission.

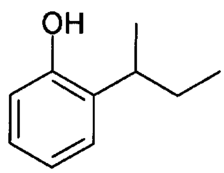
HEALTH ELEMENTS

13.1 ACUTE TOXICITY
ORAL

TEST SUBSTANCE

o-sec-Butylphenol

CAS No. 89-72-5



METHOD

OECD Guidelines No. 401	
GLP: (Y)	
Year study performed: 1991	

Species: Sprague-Dawley strain rat

Sex: Males and females

No of animals per sex per dose: Five males and five females

Vehicle: The test material was prepared as a solution in Arachis oil B.P.

Route of administration: Oral, gavage

Remarks: At the start of the study the animals were five to eight weeks old. A range-finding study was performed using pre-selected dose levels to determine the highest dose level that caused no deaths. Animals treated with undiluted test material at dose levels of 2000 and 5000 mg/kg died within one hour of treatment. Increased salivation, ptosis and coma were noted before death.

Animals treated with test material in arachis oil B.P at dose levels of 5000 and 2000 mg/kg were found dead during the day of dosing on one day after treatment. Animals treated with 2000 mg/kg appeared normal throughout the study. Therefore chosen as dose level for the main study. Following a range finding study, a group of ten fasted animals were given a single oral dose of test material, at a dose level of 200 mg/kg body weight. The animals were observed for fourteen days after day of dosing and were dilled for gross pathological examination.

RESULTS

LD50 value of the test material was found to be greater than 200 mg/kg body weight, but less than 2000 mg/kg body weight (using range finding information). There were no deaths. Lethargy was noted in all animals during the study. All animals in the main study appeared normal two hours after dosing and for the rest of the treatment and showed expected gain in body weight. No abnormalities were noted at necropsy. There were no deaths in the main study at 2000 mg/kg.

CONCLUSIONS

The acute oral median dose (LD50) of the test material, in the Sprague-Dawley strain rat was found to be greater than 200 mg/kg body weight, but less than 2000 mg/kg body weight. The test material is classified as harmful and the symbol Xn and the risk phrase R22 "Harmful if swallowed" are therefore required according to the EEC labelling regulations.

DATA QUALITY

The study was conducted to OECD guidelines and GLP.

REFERENCES

Phenol 2-(1-methylpropyl): Range Finding Acute Oral Toxicity Test in the Rat –Test report by Sandoz Chemical td. Study Ref 47/1560. Issued by Safepharm Laboratories, P.O Box No. 45, Derby, DE1 2BT, U.K.

OTHER

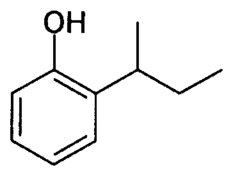
Study Ref: 47/1560

13.2 ACUTE TOXICITY
SKIN IRRITATION

TEST SUBSTANCE

o-sec-Butylphenol

CAS No. 89-72-5



OECD Guidelines No. 404
GLP: (Y)
Year study performed: 1991

Species: New Zealand White Rabbits

Sex: Males and females

No of animals per sex per dose: Two males and four females

Vehicle: 0.5 ml of the test material was introduced under a patch.

Remarks: A group of three rabbits were given a single 4-hour exposure semi-occluded application of the test material to the intact skin. The animals were observed for fourteen days after the day of the dosing. A further three animals were exposed to the test material for 3 minutes.

RESULTS

4-hour exposure period:
Severe erythema and oedema was noted at all skin sites one hour after patch removal. Evaluation of the erythema and oedema was not possible at the 24, 48, 72-hour and 7-day observations due to other adverse reactions. These included haemorrhage of the dermal capillaries, hardened dark brown/black coloured scabs, blanching, well-defined of moderate erythema surrounding the treatment site, undulating scabs, scabs lifting at edges to reveal either dried blood or light brown-coloured scabs with small areas of dried blood. These reactions were considered to be indicative of dermal corrosion.

3-minute exposure period:
Well-defined or moderate to severe erythema was noted at all treated skin sites one, 24, 48 and 72-hours after patch removal. Moderate to severe oedema was noted at all treated skin sites one hour after patch removal. Slight to severe oedema was noted at the 24-hour observation with very slight to moderate

oedema at the 72-hour observation. Very slight to mild oedema was noted at two treated skin sites at the 7-day observation. Evaluation of the erythema and oedema was not possible at one treatment site at the 72-hour observation and all treated sites at the 7-day observations due to other adverse reactions. These included haemorrhage of the dermal capillaries, light brown discolouration of the epidermis, loss of skin elasticity, thickening of the skin, hardened dark brown/black-coloured scab, well-defined erythema surrounding the treated site, hardened light brown-coloured scab, reduced re-growth of fur and desquamation.

CONCLUSION

The test material was classified as corrosive according to the EEC labelling regulations. The symbol C and risk phrase R34 "Causes burns" are required.

DATA QUALITY

Study conducted to OECD guidelines and GLP

REFERENCES

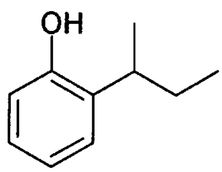
Phenol 2-(1-methylpropyl): Acute Dermal Irritation Test in the Rabbit, Test Report by Sandoz Chemicals. Study Ref : 47/1561. Issued by Safepharm Laboratories, P.O. Box No. 45, Derby, DE1 2BT, U.K.

15.1 GENETIC TOXICITY IN VITRO (GENE MUTATIONS)

TEST SUBSTANCE

o-sec-Butylphenol

CAS No. 89-72-5



The substance used for this report was 98%.

METHOD

Guideline followed: Ames test Zeiger and Drake 1980; Haworth et al, [1983]	
Type: The *Salmonella* preincubation assay	System of testing: Bacterial
GLP: No data available, but given the date, author and sponsoring agency GLP is likely.	
Year study performed: 1985	

Species/strain: *Salmonella typhimurium,* TA 1535, TA 1537, TA 98 and TA 100.

Metabolic activation: Aroclor 1254 induced rat or hamster liver 10% S-9 fraction

Concentrations tested: 0, 3, 10, 16, 33, 100 and 166 μg/plate

Remarks: Chemicals were tested and evaluated as coded samples (aliquots) using *Salmonella* strains treated in the presence and absence of metabolic activation with the test material dissolved in DMSO. At least five dose levels of the chemicals were tested, with three plates per dose level. All assays were repeated. Concurrent solvent and positive controls were tested with and without the metabolic activation systems.

The following mutagens were used as concurrent positive controls: sodium azide for TA 1535 and TA 100, 4-nitro-o-phenylenediamine for TA 98 and 9-aminoacridine for TA 97 and TA 1537; 2-aminoanthracene was used with all strains with hamster and rat liver metabolic activation systems. The dose levels used by all three laboratories have been reported elsewhere [Haworth et al, 1983]. Three of the mutagens, 9-aminoacridine hydrochloride H_2O, 4-nitro-o-phenylenediamine and tris (1,3-dichcloro-2-propyl)phosphate were positive controls which were sent coded to each laboratory. Potassium chloride was a coded negative control.

The criteria used for data evaluation were based on a) mutagenic a dose related increase in number of revertants over background even if the increase was less than twofold, b) non mutagenic response when no increase in the number of revertants was elicited by the chemical c) equivocal when there was an absence of clear-cut-dose-related increase in revertants.

RESULTS

In this study o-sec butylphenol did not induce a dose-related increase in mutant colonies over DMSO in any strain in the absence or presence of metabolic activation. Slight clearing of background lawn was observed at 166 μg/plate in strains TA 100, TA 1537 and TA 98 without metabolic activation.

CONCLUSIONS

The test substance is not genetically active in the Ames *Salmonella typhimurium* assay.

Lab: SRI

DATA QUALITY

No mention of GLP, but given the date, author and sponsoring agency GLP is likely.

REFERENCES

Salmonella Mutagenicity Tests: II. Results from the Testing of 270 Chemicals

OTHER

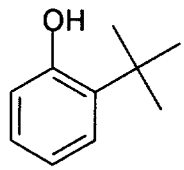
Study Ref: Environmental Mutagenesis Volume 8, Supplement 7:1-119 (1986)

PHYSICAL/CHEMICAL ELEMENTS

1.1 MELTING POINT

TEST SUBSTANCE

2-*tert*-Butylphenol



CAS No. 88-18-6

METHOD

Method/guideline followed: information not available.

GLP (Y/N): No.

Year study performed: Not known.

RESULTS

Melting point: -6.8°C.

CONCLUSIONS

The test substance has a melting point of -6.8°C.

DATA QUALITY

Not a GLP study.

Information taken from standard reference book (peer reviewed).

Purity of the test substance / decomposition: information not available in reference.

REFERENCES

Lide, D.R. (ed.). CRC Handbook of Chemistry and Physics. 75th ed. Boca Raton, F1: CRC Press Inc., 1994-1995., p. 3-255.

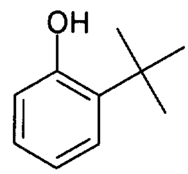
OTHER

2.1 BOILING POINT

TEST SUBSTANCE

2-*tert*-Butylphenol

CAS No. 88-18-6



METHOD

Method/guideline followed: information not available in reference.

GLP (Y/N): no.

Year study performed: not known.

RESULTS

Boiling point: 223°C.

Pressure: 760 mm Hg.

CONCLUSIONS

The test substance has a boiling point of 223°C.

DATA QUALITY

Not a GLP study.

Information taken from standard reference book (peer reviewed).

Purity of the test substance / decomposition: information not available in reference.

REFERENCES

Lide, D.R. (ed.). CRC Handbook of Chemistry and Physics. 75th ed. Boca Raton, Fl: CRC Press Inc., 1994-1995., p. 3-255.

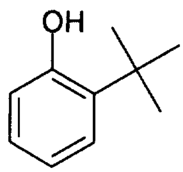
OTHER

3.1 VAPOUR PRESSURE

TEST SUBSTANCE

2-*tert*-Butylphenol

CAS No. 88-18-6



METHOD

Method/guideline followed: information not available in database.

GLP (Y/N): not known.

Year study performed: not known.

RESULTS

Vapour pressure: 0.09 mm Hg @ 25°C (12.0 Pa).

CONCLUSIONS

The test substance has a vapour pressure of : 0.09 mm Hg @ 25°C (12.0 Pa).

DATA QUALITY

Extrapolated value.

Purity of the test substance / decomposition: information not available in database.

REFERENCES

SRC PhysProps database using data from Perry, R.H. and Green, D. (1984); Perry's Chemical Engineers' Handbook., 6th ed. McGraw-Hill, New York.

OTHER

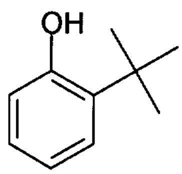
A vapour pressure of 14.85 Pa is quoted for 2-*tert*-butylphenol in Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994.

4.1 PARTITION COEFFICIENT

TEST SUBSTANCE

2-*tert*-Butylphenol

CAS No. 88-18-6



METHOD

Method/guideline followed: not known.

GLP (Y/N): not known.

Year study performed: 1995.

RESULTS

Log Kow: 3.31.

CONCLUSIONS

The test substance has a log Kow of 3.31.

DATA QUALITY

Information taken from Hazardous Substances Database (HSDB).

REFERENCES

Hansch, C., Leo, A., Hoekman. Exploring QSAR – Hydrophonic, Electronic and Steric Constants. Washington DC: American Chemical Society, 1995 as cited in HSDB Database.

OTHER

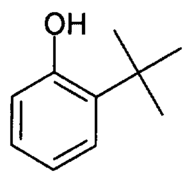
A pKa value of 10.28 is quoted in Schueuerman G; Sci Total Environ 109/110: 221-35 (1991). Original reference: Schultz, T.W. and Cajina-Quezada, M.; Structure-Activity Relationships for Mono Alkylated or Halegenated Phenols, Toxicol. Lett., 37 (1987) 121-130

5.1 WATER SOLUBILITY

TEST SUBSTANCE

2-*tert*-Butylphenol

CAS No. 88-18-6



METHOD

Method/guideline followed: calculation using a calculated log Kow value of 3.42.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Water solubility: 343.9 mg/l @ 25°C.

CONCLUSIONS

The test substance has a calculated water solubility of 343.9 mg/l.

DATA QUALITY

Calculation.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. WSKOW v1.33.

OTHER

A pKa value of 10.28 is quoted in Schueuerman G; Sci Total Environ 109/110: 221-35 (1991). Original reference: Schultz, T.W. and Cajina-Quezada, M.; Structure-Activity Relationships for Mono Alkylated or Halegenated Phenols, Toxicol. Lett., 37 (1987) 121-130

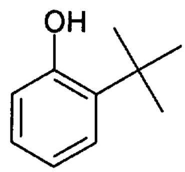
ENVIRONMENTAL FATE AND PATHWAY ELEMENTS

6.1 PHOTODEGRADATION

TEST SUBSTANCE

2-*tert*-Butylphenol

CAS No. 88-18-6



METHOD

Method/guideline followed: calculation using the programme AOPWIN v1.88.

Test type: calculation of the rate constant for the atmospheric reaction between photochemically produced hydroxyl radicals and the test substance in the vapour phase.

GLP (Y/N): no.

Year study performed: calculation made for this HPV submission.

RESULTS

Sensitizer: hydroxyl radical.

Overall hydroxyl rate constant: 40.6×10^{-12} cm^3/molecule-sec.

Half-life: 3.16 hours.

CONCLUSIONS

The programme estimates that in a typical atmosphere 50% of the test substance will undergo reaction in 3.16 hours.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. AOPWIN v 1.88.

OTHER

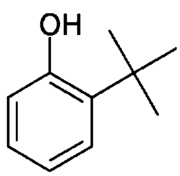
No experimental data was found on direct aqueous photolysis of the test substance. However, *p*-cresol, a related substance, in aqueous solution is reported as having a half-life of 35 days in sunlight (Smith, J.H. et al, "Environmental Pathways of Selected Chemicals in Freshwater Systems: Part II. Laboratory Studies," EPA-600/7-78-074, May 1978. Cited in Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, page 8-38.

7.1 STABILITY IN WATER

TEST SUBSTANCE

2-*tert*-Butylphenol

CAS No. 88-18-6



COMMENT

No abiotic hydrolysis studies were located.

The category phenols do not possess any functional groups that are regarded as being susceptible to hydrolysis under environmental conditions (Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, pages 7-4 and 7-5).

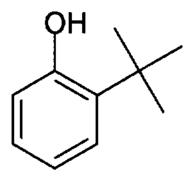
The software prediction programme HYDROWIN v1.66 cannot estimate hydrolysis rate constants for phenols.

8.1 TRANSPORT BETWEEN ENVIRONMENTAL COMPARTMENTS (FUGACITY)

TEST SUBSTANCE

2-*tert*-Butylphenol

CAS No. 88-18-6



COMMENT

Test type: Calculation of partitioning between environmental compartments.

Year study performed: Model run for this HPV submission.

Model: Level 1 Fugacity-Based Environmental Partitioning Model v2.11.

Input values

Chemical specific

Molecular mass:	150
Data temperature (°C):	25
Water solubility (mg/l):	344
Vapour pressure (Pa):	12
Log Kow:	3.31
Melting point (C):	-6.8

Environmental conditions: defaults used.

RESULTS

Environmental compartment	percentage of test substance
Air	27.0
Soil	46.3
Water	25.6
suspended sediment	0.032
fish	0.0026
Sediment	1.03

DATA QUALITY

The Mackay Level I Fugacity Model estimates the equilibrium distribution of a fixed quantity of a non-reacting chemical in a closed environment at equilibrium; with no degradation reactions and no flow or intermedia transport processes. The chemical is assumed to distribute instantaneously to an equilibrium concentration and therefore the medium receiving the emission is unimportant. This model is an aid to understanding the physical chemistry properties that are of greatest importance in determining the environmental distribution of substances; it is not a tool to predict actual or likely concentrations in a real environment.

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 and therefore their physical chemistry properties are unlikely to be affected by the pH values normally found in the environment.

REFERENCES

This software program is available with the publication: Mackay, D., Multimedia environmental models: the fugacity approach, Lewis Publishers Inc., Chelsea, MI, 1991.

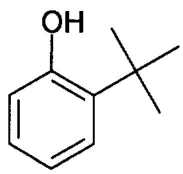
OTHER

9.1 BIODEGRADATION

TEST SUBSTANCE

2-*tert*-Butylphenol

CAS No. 88-18-6



METHOD

Method/guideline followed: calculation using the programme BIOWIN v3.65.

Test type: calculation of the probability for rapid aerobic biodegradation of the test substance in the presence of mixed populations of environmental microorganisms.

GLP (Y/N): no.

Year study performed: calculation made for this HPV submission.

RESULTS & CONCLUSIONS

The program predicts:

Primary biodegradation in days - weeks

Ultimate biodegradation in weeks - months.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. BIOWIN v 3.65.

OTHER

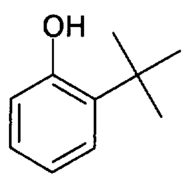
ECOTOXICITY ELEMENTS

10.1 ACUTE TOXICITY TO FISH

TEST SUBSTANCE

2-*tert*-Butylphenol

CAS No. 88-18-6



Purity of the test substance: mixture containing 2.273% of 2-*tert*-butylphenol.

METHOD

Method: OECD Guideline No. 203 US EPA 40 CFR Part 797.1400	
Test type: Static	
GLP: (Y)	
Year study performed: 1992	

Species/strain: Fathead minnow *Pimephales promelas*

Test substance preparation: Water used for acclimation of test organisms and for all toxicity testing was dechlorinated tap water. The test substance was added directly to dilution water to formulate test media without the use of a solvent.

Analytical monitoring: None, nominal concentrations were used.

Exposure period: 96 hours

Statistical methods: Results of the toxicity test were interpreted using standard statistical techniques (the probit method). Computer methods (Stephan, 1983) were used to calculate LC50 values.

Deviations from protocol:

The hardness of the dilution water was greater than 50 mg/l and fish were not acclimated to the water hardness employed during the definitive test. These protocol deviations did not, in the author's opinion, affect the outcome of the toxicity test. No other deviations were made from the protocol.

Test conditions: The test was conducted as an acute screening test. Ten fathead minnows were indiscriminately distributed to a single replicate of each concentration. A 16 hour light and 6 hour dark photoperiod was maintained. Aeration was not required to maintain dissolved oxygen concentration above acceptable levels.

Control:

Temperature 21.1 – 22.1°C
Dissolved oxygen 75 – 102% saturation
pH 7.8 – 8.2
Conductivity 600 – 660 µohms/cm
Hardness 176 mg/l $CaCO_3$

Test treatment:

Temperature 21.5 – 22.3°C
Dissolved oxygen 51 – 102% saturation
pH 7.8 – 8.3
Conductivity 600 – 670 µohms/cm
Hardness 176 mg/l $CaCO_3$

Remarks: The first acute screening test was conducted for 96 hours. Nominal concentrations were 0, 1, 10, 100 and 1,000 mg/l. The concentrations were formulated by the addition of the test substance directly to the dilution water without the use of a solvent. The test was repeated because dilution water had an incorrect hardness.

RESULTS

Nominal concentrations: 0, 1, 10, 100 and 1,000 mg/l

Remarks:

During the test all non-control test vessels contained insoluble material that was stuck to the plastic weight boat (weight boats were placed in the test vessels) and on the surface in all test vessels containing the test substance.

LC50 (96hr): 680 mg/l

Nom. concn.	Percentage mortality					Percentage affected				
(mg/l)	0	24	48	72	96	0	24	48	72	96
Control	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	10	0	0	0	0	0
1000	0	0	50	50	60	0	100	50	50	40

All affected fish exposed to 1,000 mg/l were lethargic, gasping, exhibited erratic swimming, and/or were dark in colour at 24 to 96 hours.

CONCLUSIONS

Exposure of test organisms to the test substance, a mixture containing 2.273% of 2-*tert*-butylphenol, resulted in a 96 hour LC50 of 680 mg/l (equivalent to 15.5 mg 2-*tert*-butylphenol/l).

DATA QUALITY

Method follows OECD guideline

GLP study

REFERENCES

Acute Toxicity of a Mixture of 2-tert-Butylphenol to the Fathead Minnow *(Pimephales promelas)*
Results of Range finding test. Document ID 8690000471s
TR Wilbury Labs Inc. Massachusetts 01945

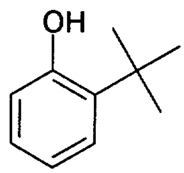
OTHER

10.2 ACUTE TOXICITY TO FISH

TEST SUBSTANCE

2-*tert*-Butylphenol

CAS No. 88-18-6



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2001

Species: Fish

Exposure period: 96 hours, 30 days, 90 days

RESULTS

LC50 (96hr) 2.935 mg/l

ChV (30 day) 0.433 mg/l

ChV (90 day) 0.041 mg/l

Remark: log Kow used 3.42 (calculated value)

CONCLUSIONS

Estimated LC50 (96hr) for the test substance was found to be 2.935 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v.0.99e

OTHER

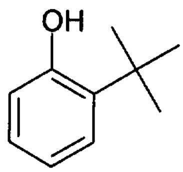
Estimation performed for this HPV submission

11.2 TOXICITY TO AQUATIC PLANTS (E.G., ALGAE)

TEST SUBSTANCE

2-*tert*-Butylphenol

CAS No. 88-18-6



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2001

Species: Green algae

Exposure period: 96 hours

RESULTS

EC50 (96hr) 4.111 mg/l

ChV (96hr) 0.935 mg/l

Remark: log Kow used 3.42 (calculated value)

CONCLUSIONS

Estimated EC50 (96hr) for the test substance was found to be 4.111 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v.0.99e

OTHER

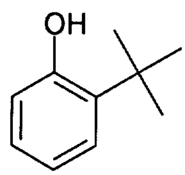
Estimation performed for this HPV submission

12.2 ACUTE TOXICITY TO AQUATIC INVERTEBRATES (E.G., DAPHNIA)

TEST SUBSTANCE

2-*tert*-Butylphenol

CAS No. 88-18-6



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2001

Species: Daphnid

Exposure period: 48 hours, 21 days

RESULTS

LC50 (48hr) 2.118 mg/l

ChV (21day) 0.318 mg/l

Remark: log Kow used 3.42 (calculated value)

CONCLUSIONS

Estimated LC50 (48hr) for the test substance was found to be 2.118 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v.0.99e

OTHER

Estimation performed for this HPV submission

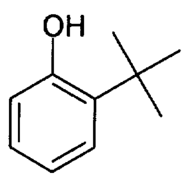
HEALTH ELEMENTS

13.1 ACUTE TOXICITY
ORAL

TEST SUBSTANCE

2-*tert*-Butylphenol

CAS No. 88-18-6



Purity of test substance: 99.96% by GLC

METHOD

Method: OECD Guideline No. 401
GLP: Data not available
Year study performed: 1990

Species/strain: Fischer 344 rats

No. of animals per sex per dose: 5 males and 5 females

Vehicle: Corn oil

Route of administration: Oral, gavage

Dose level: 474, 664, 930, 2551 and 5000 mg/kg

Remarks: A preliminary test utilising groups of one male and one female rat treated at 100, 500 and 1500 mg/kg indicated that the acute median lethal oral dose (LD50) was between 500 and 1500 mg/kg.

RESULTS

LD50 789 mg/kg (95% confidence interval 653 to 1017), slope 8.9, males and females
LD50 789 mg/kg (95% confidence interval 695 to 914), slope 8.9, males and females combined.

Number of deaths at each dose level:

Dose (mg/kg)	Cumulative mortality	
	Male	Female
474	0/5	0/5
664	1/5	1/5
930	4/5	4/5
2551	5/5	5/5
5000	5/5	5/5

There were deaths among rats dosed at 664 mg/kg and above and no rat survived oral administration of the test substance at 2551 and 5000 mg/kg. The majority of deaths occurred during Day 1 (5000 mg/kg) or Day 2 (930 and 2551 mg/kg) but single animals dosed at 664 and 930 mg/kg were found dead on Day 3 and a single male was killed on humane grounds on Day 10.

Clinical signs: Lachrymation, abasia/ataxia, and prostration. The time of onset of these clinical signs was inversely related to the administered dose. A hunched posture and lethargy were common at the lower and intermediate dose levels, particularly at 664 mg/kg. An unkempt appearance and/or yellow staining of the anogenital zone developed in the majority of rats surviving to Day 2. Among the animals dosed at 5000 mg/kg there were incidences of pallor or a darkened appearance of the eye, cyanosis and wheezing. Coma was observed at dose levels of 664 mg/kg and was always followed by death. There were isolated cases of diarrhoea, tachypnoea, hypothermia, tremor, salivation, piloerection, epiataxis, periorbital encrustation and swelling or opacity of the eye.
Most clinical signs were first apparent within 4 hours of dosing. Recovery of rats surviving treatment, as judges by external appearance and behaviour was advanced by Day 3 and completed by Day 11.

All surviving rats had gained weight relative to their Day 1 body weights by the end of the 14 day observation period.

Necropsy findings:
An unkempt appearance, corneal opacity and either pallor or a darkened appearance of the eyes were commonly noted. The principal internal macroscopic abnormalities revealed exaggerated hepatic lobular pattern, darkened liver, darkened spleen, renal pallor and/or a granular appearance of the kidneys and inflammation with abnormal content of the gastrointestinal tract. No significant lesions were found among the rats terminated on Day 15.

CONCLUSIONS

Acute oral LD50 of 2-*tert*-butylphenol in fasted rats of both sexes was found to be 789 mg/kg.

DATA QUALITY

Method follows OECD Guideline

REFERENCES

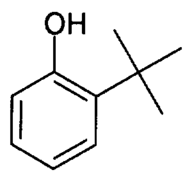
O-tert-butylphenol – Acute Oral Toxicity.
Document ID 86960000557
Shell Research Ltd, Sittingbourne Research Centre, Sittingbourne, Kent, England

13.2 ACUTE TOXICITY
DERMAL

TEST SUBSTANCE

2-*tert*-Butylphenol

CAS No. 88-18-6



Purity of the test substance: 99.96% by GLC

METHOD

Method: OECD Guideline No. 402
GLP: Data not available
Year study performed: 1990

Species/strain: Fischer 344 rats

No of animals per sex per dose: 5 males and 5 females

Vehicle: Substance administered as such

Route of administration: Dermal

Dose levels: 1020, 1420 and 2000 mg/kg (males) and 520, 720, 1020 and 2000 mg/kg (females)

Remarks: A single dose of the undiluted test material was applied to the rat skin and held in place with a lint dressing covered with waterproof adhesive tape. Following a 24-hour exposure the dressings were removed, the skin washed with warm dilute detergent solution and dried.

RESULTS

LD50 1373 mg/kg (95% confidence interval 1124 – 1473), slope 40.9, males
LD50 705 mg/kg (95% confidence interval 574 – 756), slope 41.0, females

There were deaths on Day 2 to 5.

Clinical signs:
Haematuria was apparent in all rats except three females that were among the first decedents. There were no other clinical signs among rats dosed at 520 mg/kg.
The reactions to treatment at higher dose levels were lethargy and prior to death lachrymation, pale eyes, hypothermia, prostration and coma. Isolated cases of skin pallor, periorbital encrustation, hunched posture, unkempt appearance and yellow staining of the anogenital zone were also observed. Recovery from these clinical signs was advanced by Day 2 and, with one exception, was complete by Day 7.

Losses of body weight or minimal body weight gains were recorded for all rats surviving at completion of the first week of the observation period. All surviving rats had gained weight relative to their Day 1 body weights at the end of the 14 day observation period.

After removal of the occlusive dressing on Day 2, the treated skin showed inflammation, a brown wrinkled appearance or a chemical burn. Scab formation followed between Days 6 and 10 and this persisted at termination on Day 15.

Necropsy findings:
Necropsy findings of decedents included darkened appearance and potechiation of thymus, soft brain, lung congestion, pallor and exaggerated lobular pattern of the liver, dark spleen, pallor of the renal cortex or darkening of the renal medulla, inflammation and abnormal content of the urinary bladder, inflammation of stomach and abnormal gastrointestinal contents. Four rats killed at Day 14 showed exaggerated hepatic lobular pattern.
Findings of inflammation, discolouration, scab formation and subcutaneous congestion or inflammation at the dermal test sites were consistent with in-life observations.

CONCLUSION

As there was a clear sex-related difference in the toxicity of 2-*tert*-butylphenol, no LD50 value for rats of both sexes were computed.

DATA QUALITY

Method follows OECD Guideline

REFERENCES

O-tert-butylphenol – Acute Dermal Toxicity
Document ID 86960000557
Shell Research Ltd, Sittingbourne Research Centre, Sittingbourne, Kent, England

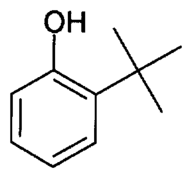
OTHER

15.1 GENETIC TOXICITY IN VITRO (GENE MUTATION ASSAY)

TEST SUBSTANCE

2-*tert*-Butylphenol

CAS No. 88-18-6



Purity of the test substance: Data not available however, identity was confirmed by comparing an infra-red spectrum of the test substance with a published spectrum of 2-*tert*-butylphenol.

METHOD

Method: Ames test
Type: Reverse mutation assay System of testing: Bacterial, Plate Incorporation Assay was used.
GLP: (Y)
Year study performed: 1989

Species/strain: *Salmonella typhimurium* strains TA98, TA100, TA1535, TA1537 and TA1538.
Ecsherichia coli *WP_2 uvrA pKM10*

Metabolic activation: Aroclor 1254 induced rat liver 10% S-9 fraction.

Concentrations tested: 31.25, 62.5, 125, 250, 500, 1000, 2000 and 5000 μg/plate.

Test design: The solutions of the test substance in acetone were added to top agar mix and were tested both in the presence and absence of S-9 mix. All tests were carried out in triplicate. The replicate assays were carried out on different days in order to confirm the reproducibility of the results. All cultures were incubated at 37°C for 48-72 hours before the revertant colonies were counted.

Remarks: The test compound formed an oily film on the surface of the top agar at 500 μg/plate and above, showing that it was not miscible in the aqueous test system at these concentrations.
The addition of 2500 μg/plate per ml of the test substance (equivalent to approx. 5000 μg/plate) caused the pH of the medium to change from 7.31 to 7.42.

The following mutagens were used as concurrent positive control:

Bacterial strain	Positive control (without S-9)	(with S-9)
E. coli *WP_2 uvrA pKM10*	*Potassium dichromate*	*Benzo (a) pyrene*
S. typhimurium *TA1535*	*Sodium azide*	*2-Aminoanthracene*
S. typhimurium TA1537	9-Aminoacridine	Neutral red
S. typhimurium *TA1538*	*2-Nitrofluorene*	*Benzo (a) pyrene*
S. typhimurium *TA98*	*2-Nitrofluorene*	*Benzo (a) pyrene*
S. typhimurium *TA100*	*Sodium azide*	*Benzo (a) pyrene*

RESULTS

In this study, the test substance did not increase the reverse mutation frequency in any of the bacterial strains, in either presence or absence of metabolic activation. Microscopical evaluation of the background lawn showed evidence of cytotoxicity in all bacterial tester strains both in the presence and absence of S-9 mix.

CONCLUSIONS

2-tert-butylphenol is not genotoxic in the selected bacterial tester strains.

DATA QUALITY

GPL study

REFERENCES

Bacterial Mutagenicity Studies with *Ortho-Tert*-Butylphenol
Document ID 8690000558
Shell Research Ltd. Sittingbourne Research Centre, Sittingbourne, Kent, England

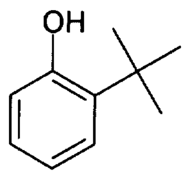
OTHER

OTHER
TUMOUR INHIBITORY EFFECTS OF PHENOLIC COMPOUNDS ON BENZO(A) PYRENE-INDUCED NEOPLASIA

TEST SUBSTANCE

2-*tert*-Butylphenol

CAS No. 88-18-6



Purity of the test substance: 99%

METHOD

Method: See below	
GLP: Data not available	
Year study performed: 1980	

Species/strain: Mouse ICR/Ha strain

Route of administration: Oral, dietary

Exposure period: 38 days

Dose/concentration: 0.03 mmol/g (= 4,500 ppm in diet)

Sex: Females

No of animals per dose: 20 in each of two experiments.

Frequency of treatment: continuous in the diet for 5.5 weeks. 1 mg benzo(a)pyrene (BP) by gavage, twice/week for 4 weeks, from 2nd week of test diet administration.

Positive control: BP as before, but no dietary addition of the test substance

Post exposure observation period: 16 weeks

Statistical methods: Student's T test was used to determine the statistical differences in the number of tumors per group between the control and treated groups, and the χ^2test was used for the differences in percentage of tumour bearing animals in these groups.

Test conditions: The mice were placed on a diet containing the test substance or diet without additions (control group) when they were 9 weeks of age. On the eighth day, the mice were given the first of 8 doses (2 times a week for 4 weeks) of 1 mg of BP in 0.2 ml of corn oil. The experimental diets were fed during the entire period of carcinogen administration and were discontinued 3 days after the last dose of carcinogen, at which time the mice were 98 days old. The mice were then fed pellets of rat chow, until they were killed at 211 days old and autopsied. Tumors of the forestomach were counted under a dissecting microscope. Tumors that were 1 mm or larger were recorded and checked histologically.

RESULTS

In the control group (animals given BP but no dietary addition of phenol), 90 – 100% of animals had neoplasms of the forestomach and the average number of tumours per animal was between 4.1 and 5.8. In the animals given dietary addition of 2-*tert*-butylphenol, 85 - 95% of animals had neoplasms of the forestomach, but the number of neoplasms per animal was reduced to about 60% of the controls, which was statistically significant.

CONCLUSION

Significant inhibitory activity of 2-*tert*-butylphenol was demonstrated in this mouse model, but the relevance of this to possible protection effects in humans is not known.

DATA QUALITY

Reliable, without restrictions

REFERENCES

Department of Laboratory Medicine and Pathology, University of Minnesota, Minneapolis. Cancer Research 40, 2820- 2823. August 1980.

OTHER

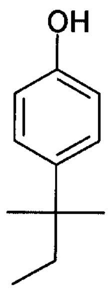
PHYSICAL/CHEMICAL ELEMENTS

1.1 MELTING POINT

TEST SUBSTANCE

p-tert-Amylphenol

CAS No. 80-46-6



METHOD

Method/guideline followed: information not available in reference.

GLP (Y/N): no.

Year study performed: not known.

RESULTS

Melting point: 94 - 95°C.

CONCLUSIONS

The test substance has a melting point range of 94 - 95°C.

DATA QUALITY

Not a GLP study.

Information taken from a standard reference book.

Purity of the test substance / decomposition: information not available in reference.

REFERENCES

The Merck Index – Encyclopedia of Chemicals, Drugs and Biologicals. Rahway, NJ: Merck and Co., Inc., 1989, p. 1132.

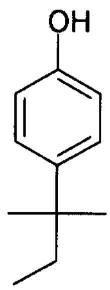
OTHER

2.1 BOILING POINT

TEST SUBSTANCE

p-tert-Amylphenol

CAS No. 80-46-6



METHOD

Method/guideline followed: information not available in reference.

GLP (Y/N): no.

Year study performed: not known.

RESULTS

Boiling point: 262.5°C (atmospheric pressure assumed).

CONCLUSIONS

The test substance has a boiling point of 262.5°C.

DATA QUALITY

Not a GLP study.

Information taken from a standard reference book.

Purity of the test substance / decomposition: information not available in reference.

REFERENCES

The Merck Index – Encyclopedia of Chemicals, Drugs and Biologicals. Rahway, NJ: Merck and Co., Inc., 1989, p. 1132.

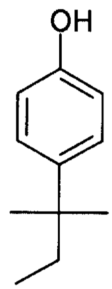
OTHER

3.1 VAPOUR PRESSURE

TEST SUBSTANCE

p-tert-Amylphenol

CAS No. 80-46-6



METHOD

Method/guideline followed: calculation.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Vapour pressure: 0.00783 mmHg @ 25°C (1.04 Pa).

CONCLUSIONS

The test substance has a calculated vapour pressure of 0.00783 mmHg @ 25°C.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. MPBPWIN v 1

OTHER

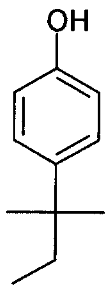
Value obtained using Modified Grain Method reported.

4.1 PARTITION COEFFICIENT

TEST SUBSTANCE

p-tert-Amylphenol

CAS No. 80-46-6



METHOD

Method/guideline followed: information not available.

GLP (Y/N): no.

Year study performed: 1987.

RESULTS

Log Kow: 4.03.

CONCLUSIONS

The test substance has a log Kow of 4.03.

DATA QUALITY

Not a GLP study.

Information taken from literature search covering appropriate databases.

Purity of the test substance: information not available.

REFERENCES

Schultz TW; Ecotoxicology and Environmental Safety 14: 178- 83 (1987)

OTHER

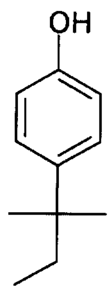
p-tert-Amylphenol has a pKa of 10.43 (Schultz TW; Ecotoxicology and Environmental Safety 14: 178 – 83 (1987).)

5.1 WATER SOLUBILITY

TEST SUBSTANCE

p-tert-Amylphenol

CAS No. 80-46-6



METHOD

Method/guideline followed: information not available in database.

GLP (Y/N): no

Year study performed: not known.

RESULTS

Water solubility: 168 mg/l at 25°C.

CONCLUSIONS

The test substance has a water solubility of 168 mg/l at 25°C.

DATA QUALITY

Not a GLP study.

Information taken from a database.

Purity of the test substance: information not available in database.

REFERENCES

Yalkowsky SH, Dannenfelser RM; Aquasol Database of Aqueous Solubility. 5th ed. Tucson, AZ Univ. of Arizona, College of Pharmacy (1992).

OTHER

p-tert-Amylphenol has a pKa of 10.43 (Schultz TW; Ecotoxicology and Environmental Safety 14: 178 – 83 (1987).)

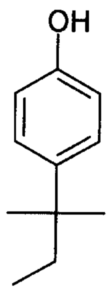
ENVIRONMENTAL FATE AND PATHWAY ELEMENTS

6.1 PHOTODEGRADATION

TEST SUBSTANCE

p-tert-Amylphenol

CAS No. 80-46-6



METHOD

Method/guideline followed: calculation using the programme AOPWIN v1.88.

Test type: calculation of the rate constant for the atmospheric reaction between photochemically produced hydroxyl radicals and the test substance in the vapour phase.

GLP (Y/N): no.

Year study performed: calculation made for this HPV submission.

RESULTS

Sensitizer: hydroxyl radical.

Overall hydroxyl rate constant: 41.8×10^{-12} cm^3/molecule-sec.

Half-life: 3.07 hours.

CONCLUSIONS

The programme estimates that in a typical atmosphere 50% of the test substance will undergo reaction in 3.07 hours.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. AOPWIN v 1.88.

OTHER

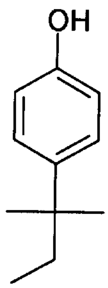
No experimental data was found on direct aqueous photolysis of the test substance. However, *p*-cresol, a related substance, in aqueous solution is reported as having a half-life of 35 days in sunlight (Smith, J.H. et al, "Environmental Pathways of Selected Chemicals in Freshwater Systems: Part II. Laboratory Studies," EPA-600/7-78-074, May 1978. Cited in Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, page 8-38.

7.1 STABILITY IN WATER

TEST SUBSTANCE

p-tert-Amylphenol

CAS No. 80-46-6



COMMENT

No abiotic hydrolysis studies were located.

The category phenols do not possess any functional groups that are regarded as being susceptible to hydrolysis under environmental conditions (Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, pages 7-4 and 7-5).

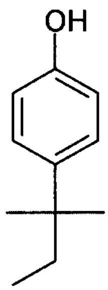
The software prediction programme HYDROWIN v1.66 cannot estimate hydrolysis rate constants for phenols.

8.1 TRANSPORT BETWEEN ENVIRONMENTAL COMPARTMENTS (FUGACITY)

TEST SUBSTANCE

p-tert-Amylphenol

CAS No. 80-46-6



METHOD

Test type: Calculation of partitioning between environmental compartments.

Year study performed: Model run for this HPV submission.

Model: Level 1 Fugacity-Based Environmental Partitioning Model v2.11.

Input values

Chemical specific

Molecular mass:	164
Data temperature (°C):	25
Water solubility (mg/l):	168
Vapour pressure (Pa):	1.04
Log Kow:	4.03
Melting point (°C):	94.5

Environmental conditions: defaults used.

RESULTS

Environmental compartment	Percentage of test substance
Air	1.88
Soil	87.0
Water	9.16
suspended sediment	0.060
fish	0.0049
Sediment	1.93

DATA QUALITY

The Mackay Level I Fugacity Model estimates the equilibrium distribution of a fixed quantity of a non-reacting chemical in a closed environment at equilibrium; with no degradation reactions and no flow or intermedia transport processes. The chemical is assumed to distribute instantaneously to an equilibrium concentration and therefore the medium receiving the emission is unimportant. This model is an aid to understanding the physical chemistry properties that are of greatest importance in determining the environmental distribution of substances; it is not a tool to predict actual or likely concentrations in a real environment.

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 and therefore their physical chemistry properties are unlikely to be affected by the pH values normally found in the environment.

REFERENCES

This software program is available with the publication: Mackay, D., Multimedia environmental models: the fugacity approach, Lewis Publishers Inc., Chelsea, MI, 1991.

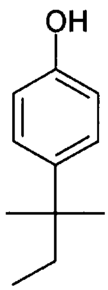
OTHER

9.1 BIODEGRADATION

TEST SUBSTANCE

p-tert-Amylphenol

CAS No. 80-46-6



METHOD

Method/guideline followed: calculation using the programme BIOWIN v3.65.

Test type: calculation of the probability for rapid aerobic biodegradation of the test substance in the presence of mixed populations of environmental microorganisms.

GLP (Y/N): no.

Year study performed: calculation made for this HPV submission.

RESULTS & CONCLUSIONS

The program predicts:

Primary biodegradation in days/weeks

Ultimate biodegradation in weeks/months.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. BIOWIN v 3.65.

OTHER

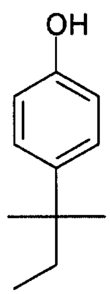
ECOTOXICITY ELEMENTS

10.1 ACUTE TOXICITY TO FISH

TEST SUBSTANCE

p- tert- Amylphenol

CAS No. 80-46-6



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Fish

Exposure period: 96 hours, 30 days and 90 days

RESULTS

LC50 (96hr) 1.6 mg/l

ChV (30 day) 0.24 mg/l

ChV (90 day)0.027 mg/l

Remark: log Kow used 3.91 (calculated value)

CONCLUSIONS

Estimated LC50 (96hr) for the test substance was found to be 1.6 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v.0.99e

OTHER

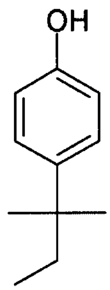
Calculation performed for this HPV submission.

11.1 TOXICITY TO AQUATIC PLANTS (E.G., ALGAE)

TEST SUBSTANCE

p- tert- Amylphenol

CAS No. 80-46-6



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Green algae

Exposure period: 96 hours

RESULTS

EC50 (96hr) 1.7 mg/l

ChV (96hr) 0.50 mg/l

Remark: log Kow used 3.91 (calculated value)

CONCLUSIONS

Estimated EC50 (96hr) for the test substance was found to be 1.7 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v.0.99e

OTHER

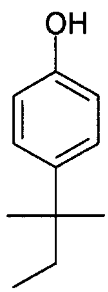
Calculation performed for this HPV submission.

12.1 ACUTE TOXICITY TO AQUATIC INVERTEBRATES (E.G., DAPHNIA)

TEST SUBSTANCE

p- tert- Amylphenol

CAS No. 80-46-6



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Daphnid

Exposure period: 48 hours, 21 days

RESULTS

LC50 (48hr) 1.5 mg/l

ChV (21day) 0.17mg/l

Remark: log Kow used 3.91 (calculated value)

CONCLUSIONS

Estimated LC50 (48hr) for the test substance was found to be 1.5 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v. 0.99e

OTHER

Calculation performed for this HPV submission.

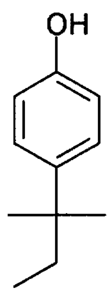
HEALTH ELEMENTS

13.1 ACUTE TOXICITY
ORAL

TEST SUBSTANCE

p-tert-Amylphenol

CAS No. 80-46-6



METHOD

Lethal dose, 50% kill
GLP: No
Year study performed: Not available (publication date was 1967)

Species: Rat.

Route of Administration: Oral.

Remarks: Details of toxic effects not reported other than lethal dose value.

RESULTS

LD50 = 1830 mg/kg.

CONCLUSIONS

LD50 = 1830 mg/kg.

DATA QUALITY

No information on guideline followed and not conducted to GLP.

Data taken from report.

REFERENCES

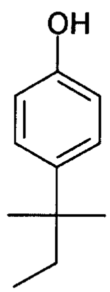
IHFCAY Industrial Hygiene Foundation of America, Chemical and Toxicological series, Bulletin. (Pittsburg, PA) 1947-69. Volume (issue)/page/year: 6,1,1967

13.2 ACUTE TOXICITY
SKIN IRRITATION

TEST SUBSTANCE

p-tert-Amylphenol

CAS No. 80-46-6



METHOD

OECD Guideline No. 404
GLP (Y)
Year study performed: 1991

Species: New Zealand white Rabbit.

Number of animals: 3 + 3.

0.5 g of the test material moistened with distilled water was introduced in a semi-occluded application to the intact rabbit skin for exposure periods of 3 minutes and 4 hours.

RESULTS

A single 4-hour application produced corrosive effects at one treated skin site. These reactions included green-coloured dermal necrosis, severe oedema and scabbing. Scar tissue was noted at the 14-day observation. Well-defined moderate to severe erythema and slight oedema were produced at the other two treated sites.

A single 3-minute application of the test material to the intact skin produced very slight erythema. The skin appeared normal 48 hours after treatment.

CONCLUSION

The test material is classified as corrosive according to EEC labelling regulations. The symbol C and risk phrase R34 "causes burns" is therefore required.

DATA QUALITY

The study was performed following OECD guidelines and GLP.

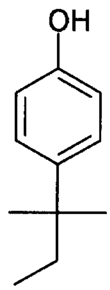
REFERENCES

Phenol, 4-(1,1-Dimethylpropyl)-Acute Dermal Irritation Test in the Rabbit –Project Number 47/2098 SafePharm Laboratories Limited, P.O Box No. 45, Derby, DE1 2BT, U.K.

15.1 GENETIC TOXICITY IN VITRO (GENE MUTATIONS)

TEST SUBSTANCE

p-tert-Amylphenol



CAS No. 80-46-6

METHOD

Method: Ames, et al., 1975; Bridges, 1972: Green and Muriel, 1976: Maron and Ames, 1983: Maron et al., 1981.
Type: Reverse mutation assay
System of testing: Bacterial: Pre incubation assay
GLP (Yes)
Year: 1993

Species/strain: *Salmonella typhimurium* TA 1535, TA 1537, TA 1538, TA 98 and TA 100 and *E.coli* WP_2 uvrA.

Metabolic activation: S9 mix (with and without) Aroclor 1254-induced male Sprague-Dawley rat liver homogenate.

Concentrations tested:
0.05, 0.0167, 0.5, 1.67, 5.00, 16.7 and 50.0 μg/plate with and without S9 mix TEST 1
0.05, 0.0167, 0.5, 1.67, 5.00, 16.7 and 50.0 μg/plate without S9 mix TEST 2
0.50, 0.167, 0.5, 1.67, 5.0,16.7, 50.5 167 and 500 μg/plate with S9 mix TEST 2
0.167, 0.50, 1.67, 5.00, 16.7, 50.5 and 100 μg/plate with S9 retest (due to cytotoxicity)

Triplicate plates

RESULTS

The test substance did not cause any increase in reverent frequency in any of the bacterial strains compared to the solvent controls.

CONCLUSIONS

Test substance is considered to be non mutagenic in this *in-vitro* test system.

DATA QUALITY

The study was performed following recognised guidelines and GLP.

REFERENCES

Pharmakon USA P.O. Box 609, Waverly, Pennsylvania 18471-0609

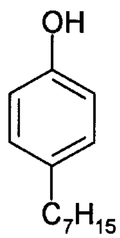
PHYSICAL/CHEMICAL ELEMENTS

1.1 MELTING POINT

TEST SUBSTANCE

Heptyl derivs (*p*-heptylphenol)

CAS No. 72624-02-3



METHOD

Method/guideline followed: calculation.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Melting point: 73.39°C.

CONCLUSIONS

The test substance has a calculated melting point of 73.39°C.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. MPBPWIN v 1.30.

OTHER

Weighted value used.

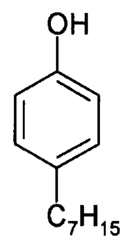
The substance is a mixture of isomers. A representative structure was used for the calculation.

2.1 BOILING POINT

TEST SUBSTANCE

Heptyl derivs (*p*-heptylphenol)

CAS No. 72624-02-3



METHOD

Method/guideline followed: calculation.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Boiling point: 296.48°C.

CONCLUSIONS

The test substance has a calculated boiling point of 296.48°C.

DATA QUALITY

Calculation method

REFERENCES

SYRACUSE Chemical Properties Prediction Program. MPBPWIN v 1.30.

OTHER

Adapted Stein & Brown method used.

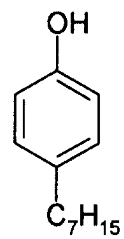
The substance is a mixture of isomers. A representative structure was used for the calculation.

3.1 VAPOUR PRESSURE

TEST SUBSTANCE

Heptyl derivs (*p*-heptylphenol)

CAS No. 72624-02-3



METHOD

Method/guideline followed: calculation.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Vapour pressure: 0.000279 mmHg @ 25°C (0.037 Pa).

CONCLUSIONS

The test substance has a calculated vapour pressure of 0.000279 mmHg @ 25°C.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. MPBPWIN v 1.30.

OTHER

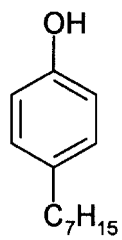
The substance is a mixture of isomers. A representative structure was used for the calculation.

4.1.PARTITION COEFFICIENT

TEST SUBSTANCE

Heptyl derivs (*p*-heptylphenol)

CAS No. 72624-02-3



METHOD

Method/guideline followed: calculation.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Log Kow: 5.01

CONCLUSIONS

The test substance has a calculated log Kow of 5.01.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. KOWWIN v 1.63 estimate

OTHER

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 (Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994).

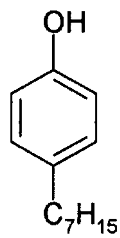
The substance is a mixture of isomers. A representative structure was used for the calculation.

5.1. WATER SOLUBILITY

TEST SUBSTANCE

Heptyl derivs (*p*-heptylphenol)

CAS No. 72624-02-3



METHODMethod/guideline followed: calculation.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Water solubility: 9.645 mg/l @ 25°C.

CONCLUSIONS

The test substance has a calculated water solubility of 9.645 mg/l @ 25°C.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. WSKOW v 1.33.

OTHER

Log Kow value of 5.01 used (see 4.1, Partition Coefficient of *p*-heptylphenol).

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 (Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994).

The substance is a mixture of isomers. A representative structure was used for the calculation.

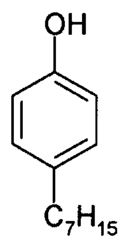
ENVIRONMENTAL FATE AND PATHWAY ELEMENTS

6.1 PHOTODEGRADATION

TEST SUBSTANCE

Heptyl derivs (*p*-heptylphenol)

CAS No. 72624-02-3



METHOD

Method/guideline followed: calculation using the programme AOPWIN v1.88.

Test type: calculation of the rate constant for the atmospheric reaction between photochemically produced hydroxyl radicals and the test substance in the vapour phase.

GLP (Y/N): no.

Year study performed: calculation made for this HPV submission.

RESULTS

Sensitizer: hydroxyl radical.

Overall hydroxyl rate constant: 48.9×10^{-12} cm^3/molecule-sec.

Half-life: 2.63 hours.

CONCLUSIONS

The programme estimates that in a typical atmosphere 50% of the test substance will undergo reaction in 2.63 hours.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. AOPWIN v 1.88.

OTHER

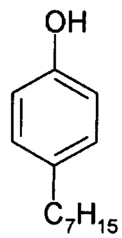
No experimental data was found on direct aqueous photolysis of the test substance. However, *p*-cresol, a related substance, in aqueous solution is reported as having a half-life of 35 days in sunlight (Smith, J.H. et al, "Environmental Pathways of Selected Chemicals in Freshwater Systems: Part II. Laboratory Studies," EPA-600/7-78-074, May 1978. Cited in Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, page 8-38.

7.1 STABILITY IN WATER

TEST SUBSTANCE

Heptyl derivs (*p*-heptylphenol)

CAS No. 72624-02-3



COMMENT

No abiotic hydrolysis studies were located.

The category phenols do not possess any functional groups that are regarded as being susceptible to hydrolysis under environmental conditions (Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, pages 7-4 and 7-5).

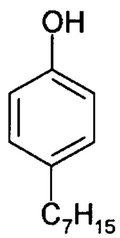
The software prediction programme HYDROWIN v1.66 cannot estimate hydrolysis rate constants for phenols.

8.1 TRANSPORT BETWEEN ENVIRONMENTAL COMPARTMENTS (FUGACITY)

TEST SUBSTANCE

Heptyl derivs (*p*-heptylphenol)

CAS No. 72624-02-3



METHOD

Test type: Calculation of partitioning between environmental compartments.

Year study performed: Model run for this HPV submission.

Model: Level 1 Fugacity-Based Environmental Partitioning Model v2.11.

Input values

Chemical specific

Molecular mass:	192
Data temperature (°C):	25
Water solubility (mg/l):	9.65
Vapour pressure (Pa):	0.037
Log Kow:	5.01
Melting point (°C):	73.39

Environmental conditions: defaults used.

RESULTS

Environmental compartment	Percentage of test substance
Air	0.16
Soil	96.6
Water	1.07
suspended sediment	0.067
fish	0.0055
Sediment	2.15

DATA QUALITY

The Mackay Level I Fugacity Model estimates the equilibrium distribution of a fixed quantity of a non-reacting chemical in a closed environment at equilibrium; with no degradation reactions and no flow or intermedia transport processes. The chemical is assumed to distribute instantaneously to an equilibrium concentration and therefore the medium receiving the emission is unimportant. This model is an aid to understanding the physical chemistry properties that are of greatest importance in determining the environmental distribution of substances; it is not a tool to predict actual or likely concentrations in a real environment.

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 and therefore their physical chemistry properties are unlikely to be affected by the pH values normally found in the environment.

REFERENCES

This software program is available with the publication: Mackay, D., Multimedia environmental models: the fugacity approach, Lewis Publishers Inc., Chelsea, MI, 1991.

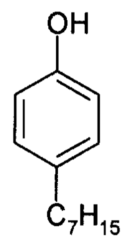
OTHER

9.1 BIODEGRADATION

TEST SUBSTANCE

Heptyl derivs (*p*-heptylphenol)

CAS No. 72624-02-3



METHOD

Method/guideline followed: calculation using the programme BIOWIN v3.65.

Test type: calculation of the probability for rapid aerobic biodegradation of the test substance in the presence of mixed populations of environmental microorganisms.

GLP (Y/N): no.

Year study performed: calculation made for this HPV submission.

RESULTS & CONCLUSIONS

The program predicts:

Primary biodegradation in days

Ultimate biodegradation in weeks.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. BIOWIN v 3.65.

OTHER

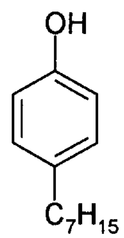
ECOTOXICITY ELEMENTS

10.1 ACUTE TOXICITY TO FISH

TEST SUBSTANCE

Heptyl derivs (*p*-heptylphenol)

CAS No. 72624-02-3



Purity of the test substance: information not available.

METHOD

OECD Guidelines No. 203, Fish Acute Toxicity Test. EPA TSCA 40 CFR Part 797.1400
Test type: Static test
GLP: (Y)
Year study performed: 1997

Species: Trout *Oncorhynchus mykiss*

Test substance preparation: Water used for acclimation of the test organisms and all toxicity testing was reconstituted hard water prepared according to EPA 1993 specifications.

Analytical monitoring: none. Nominal concentrations used.

The test was conducted as a screening assay. Each treatment utilised a single replicate with 10 organisms equally distributed among each of five test treatment and diluent control.

Control:

TOC (0hr)	0 mg/l
TOC (24hr)	0.94 mg/l
Temperature	14.3 – 15.3°C
Dissolved oxygen	96 – 105% saturation
pH	8.01 – 8.12

Hardness ($CaCO_3$)	188 mg/l
Alkalinity ($CaCO_3$)	114 mg/l
Total solids	404 mg/l

Test treatment :

TOC (0hr)	12.01 – 37.09 mg/l
TOC (24hr)	0.94 – 44.87 mg/l
Temperature	14.0 – 15.3°C
Dissolved oxygen	93 – 106% saturation
pH	8.00 – 8.16
Hardness ($CaCO_3$)	184 – 188 mg/l
Alkalinity ($CaCO_3$)	108 – 114 mg/l

Total solids not applicable

There was no renewal of the test solution during the exposure period.

Exposure period: 96 hours

Statistical methods: LC50 and EC50 values were computed using a program developed by EPA (Stephen 1983) which calculates LC50 and EC50 values and their confidence limits using the probit, binomial and Spearman-Karber methods. The no observed effect concentration (NOEC) is the highest concentration of the test substance that allows at least 90% survival of exposed organisms and does not cause sublethal effects. This definition of the NOEC differs slightly from the TSCA test guidelines.

Deviations from protocol:

1.) Hourly temperatures recorded by the data logger between hours 55 and 91 of the test indicated that during the period 33 temperature reading were 16.08°C and one was 16.2°C (limit 16°C).

2.) Hardness of the laboratory control water was 188 mg/l $CaCO_3$ (protocol range 165 – 185 mg/l $CaCO_3$).

RESULTS

Nominal concentrations: 0, 0.10, 0.35, 3.32, 33.01 and 330.00 mg/l

Remarks: Review of solubility observations showed varying levels of product remaining on the water surface. At 0 hours, no product was observed in the 0.10, 0.35 and 3.32 mg/l concentrations. An oily sheen was observed on the water surface in the 33.01 mg/l and the entire water surface in the 330.0 mg/l concentration was covered with an oily sheen.

LC50 and EC50 values with 95% confidence limits and no-observed effect concentrations, based on nominal concentrations:

LC50 + EC50(24hr) 1.02 mg/l (0.86 – 1.21 mg/l)

LC50 + EC50 (48hr) 1.02 mg/l (0.86 – 1.21 mg/l)

LC50 + EC50 (72hr) 0.94 mg/l (No estimate available)

LC50 + EC50 (96hr) 0.85 mg/l (0.35 – 3.32 mg/l)

NOEC(24hr) 0.35 mg/l

NOEC(48hr) 0.35 mg/l

NOEC(72hr) <0.10 mg/l

NOEC(96hr) <0.10 mg/l

Nominal concentration	% Mortality			
(mg/l)	Hours of Exposure			
	24	48	72	96
Control	0	0	0	0
(Level 1) 0.10	10	10	40	40
(Level 2) 0.35	0	0	0	10
(Level 3) 3.32	100	100	100	100
(Level 4) 33.01	100	100	100	100
(Level 5) 333.00	100	100	100	100

Sublethal effects were noted in the 33.01 and 330.00 mg/l concentrations as soon as the fish were added to the test solution. Fish in the 330.00 mg/l concentration were dead 5 minutes after being added to the aquarium and fish in the 33.01 mg/l concentration were dead within 25 minutes after being added to the aquarium. Fish in the 3.32 mg/l concentration exhibited sublethal effects within 20 minutes of being added to the test vessel and were dead within 3.5 hours. Sublethal effects were limited to the start of the test and no sublethal effects were observed at the 24-hour exposure.

CONCLUSIONS

Exposure of test organisms to the test substance resulted in a 96 hour LC50 of 0.85 mg/l.

The NOEC of the test substance was less than 0.10 mg/l

DATA QUALITY

Method follows OECD guideline

Information taken from the test report.

Purity of the test substance: information not available.

GLP study.

REFERENCES

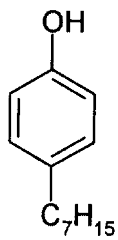
Static Acute Toxicity of Lubricant additive OS#43247K to the Trout, *Oncorhynchus mykiss* Report Number 540 Sponsor – Lubrizol Corporaion, 29400 Lakeland Boulevard, Wickliffe, Ohio 44092, USA. Testing Facility – Envirosystems Incorporated, P.O. Box 778, 1 Lafayette Road, Hampton, New Hampshire 03842, USA.

10.2 ACUTE TOXICITY TO FISH

TEST SUBSTANCE

Heptyl derivs (*p*-heptylphenol)

CAS No. 72624-02-3



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Fish

Exposure period: 96 hours, 30 days and 90 days

RESULTS

LC50 (96hr) 0.40 mg/l

ChV (30 day) 0.056 mg/l

ChV (90 day) 0.010 mg/l

Remark: log Kow used 5.01 (calculated value)

water solubility 9.65 mg/l (measured)

CONCLUSIONS

Estimated LC50 (96hr) for the test substance was found to be 0.40 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v.0.99e

OTHER

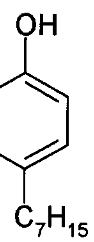
Calculation performed for this HPV submission.

11.1 TOXICITY TO AQUATIC PLANTS (E.G., ALGAE)

TEST SUBSTANCE

Heptyl derivs (*p*-heptylphenol)

CAS No. 72624-02-3



The test substance was assumed to be 100% active ingredient and to be stable under conditions of administration.

METHOD

OECD Guideline No. 201, Algal Growth Inhibition Test. 1984. U.S. EPA The *Selenastrum capricornutum* Printz Algal Assay Bottle Test EPA- 600/9-78-018. Environmental Research Laboratory, Corvallis, Oregon. 1978 EPA TSCA 40 CFR Part 797.1050
Test type: Static test
GLP: (Y)
Year study performed: 1998

Species: Green algae – *Selenastrum capricornutum* Printz

Exposure period: 96 hours, from 6th to 10th November 1997.

Analytical procedures: Nominal concentrations used.

Test substance preparation: Each of the five WAFs were prepared by stirring the mixtures of the substance and dilution water for approximately 20 hours, settling the mixtures for four hours and siphoning off the water phase containing the WAF.

The test vessels were incubated for 96 hours at 24 ± 1°C under a 24 hour light and 0 hour dark photoperiod automatically maintained with "cool-white" fluorescent lights. Light intensity was maintained at 360 – 370 ft-c. The vessels were randomly arranged on a rotary shaker at the speed of 100 rpm. Algae were distributed between two replicates of each treatment at the rate of approximately 10,000 cells/ml.

Statistical methods:

Results of the toxicity test were interpreted by standard statistical techniques (Stephan C. E. 1983) when warranted. All calculations were performed using nominal concentrations of the test substance with the number of cells/ml, then with the average specific growth rate.

The binomial/nonlinear interpolation or probit method was used to calculate the EC50 values. The no observed effect concentration (NOEC) is the highest concentration of the test substance that allowed at least 90% of control growth. This definition of the NOEC differs slightly from the TSCA test guidelines.

RESULTS

Exposure of the algae to the test substance resulted in the following growth after 96 hours:

Nominal concentrations (mg/l)	Average cells/ml	% of Control
0 (control)	1,945,000	-
0.3	1,708,000	88
3.3	86,000	4
33	<10,000	<1
330	<10,000	<1
3300	<10,000	<1

EC50 value with 95% confidence limits calculated using the number of cells/ml:

EC50 (72hr) 0.88 mg/l (0.3 – 3.3 mg/l)

EC50 (96hr) 0.83 mg/l (0.3 – 3.3 mg/l)

EC50 value with 95% confidence limits calculated using average specific growth rate:

EC50 (72hr) 2.7 mg/l (2.1 – 3.4 mg/l)

EC50 (96hr) 2.5 mg/l (2.0 – 3.2 mg/l)

NOEC (96hr) < 0.3 mg/l calculated using the number of cells/ml

NOEC (96hr) 0.3 calculated using average specific growth rate

Control response was satisfactory: the algal population grew well, resulting in an average of 1,945,000 cells/ml after 96 hours.

No biological effects (size differences, unusual cell shapes, colours, flocculations, adherence of cells to test containers or aggregation of cells) were noted during the test.

Remarks: The 3300 mg/l test concentrations were slightly cloudy at the start of the test and there was floating material in the 330 and 3300 mg/l solutions at 24, 48, 72 and 96 hours. No other insoluble material was noted during the test.

The pH of the test media was slightly affected by the test substance at all concentration above 3.3 mg/l.

The determination of whether toxic effects were algistatic or algicidal was performed at the end of the study. A 0.5 ml aliquot of test media from each 33 mg/l vessel was transferred to a flask containing 100 ml of fresh media and incubated under test conditions for 216 hours. Algae did not increase from initial density of less than 10,000 cells/ml, indicating that the effect of the test substance at 33 mg/l was algicidal rather than algistatic.

CONCLUSIONS

The 96-hour no observed effect concentration (NOEC) is less than 0.3 mg/l when determined using the number of cells/ml and 0.3 mg/l when determined using the average specific growth rate.

DATA QUALITY

Method follows OECD guideline.

Information taken from the test report.

GLP study.

REFERENCES

Acute Toxicity of the Water Accommodated Fraction (WAF) of OS # 43247K to the Fresh Water Algae *Selenastrum capricornutum*. – Range finding test

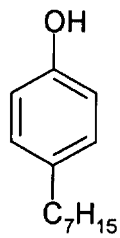
Report Number 1394-LU

11.2 TOXICITY TO AQUATIC PLANTS (E.G., ALGAE)

TEST SUBSTANCE

Heptyl derivs (*p*-heptylphenol)

CAS No. 72624-02-3



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Green algae

Exposure period: 96 hours

RESULTS

EC50 (96hr) 0.21 mg/l

ChV (96hr) 0.12 mg/l

Remark: log Kow used 5.01 (calculated value)

CONCLUSIONS

Estimated EC50 (96hr) for the test substance was found to be 0.21 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v.0.99e

OTHER

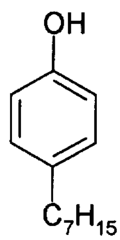
Calculation performed for this HPV submission.

12.1 ACUTE TOXICITY TO AQUATIC INVERTEBRATES (E.G., DAPHNIA)

TEST SUBSTANCE

Heptyl derivs (*p*-heptylphenol)

CAS No. 72624-02-3



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Daphnid

Exposure period: 48 hours, 21 days

RESULTS

LC50 (48hr) 0.61 mg/l

ChV (21day) 0.043 mg/l

Remark: log Kow used 5.01 (calculated value)

CONCLUSIONS

Estimated LC50 (48hr) for the test substance was found to be 0.61 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v. 0.99e

OTHER

Calculation performed for this HPV submission.

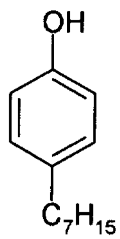
HEALTH ELEMENTS

13.1 ACUTE TOXICITY
ORAL

TEST SUBSTANCE

Heptyl derivs (*p*-heptylphenol)

CAS No. 72624-02-3



Similar to that described in Section 1500.3 – Federal Hazardous Substances Act Regulations – 16 CFR
GLP: Data not available
Year study performed: 1982

Species: Sprague-Dawley strain rat.

Sex: Males and females.

Route of administration: Oral gavage.

Remarks: 5 male and 5 female albino rats of the outbred Sprague-Dawley strain weighing between 200 and 300 g each was employed in this study. The rats were deprived of food but not water overnight prior to dosing. Each animal was weighed and dosed by direct administration of the experimental material into the stomach by means of a syringe and dosing needle. The dose level administered was 0.2 g/kg, 2.0 g/kg and 5.0 g/kg. Following administration the animals were allowed food and water *ad libitum* for the 14-day observation period during which time the rats were observed for signs of toxicity and mortalities.

RESULTS

LD50: >0.2 g/kg and <2g/kg

0.2 g/kg – The animals were ruffled after 3 hours. They had dirty coats with urine stains and a bloody discharge around the nose and mouth within 24 hours. Between 12 and 24 hours, the animals were vocalising in high pitch squeaks. The dirty coats and discharge gradually improved and the animals appeared recovered by Day 3. They appeared normal throughout the remainder of the observation period. There were no remarkable gross pathologic findings.

2.0 g/kg - The animals appeared ruffled after 3 hours. Four animals died within 24 hours. The remaining animals were dirty, oily and depressed with a discharge around the facial orifices after 24 hours. These animals subsequently died on days 2 and 3. Gross pathology noted pale spleens and mottled liver.

5.0 g/kg – The animals were lethargic with diarrhoea and dirty, oily coats after 3 hours. Eight animals died within 24 hours. The remaining animals were moribund exhibiting a discharge around the facial orifices. They died within 48 hours. Gross pathologic examination revealed nothing remarkable.

CONCLUSIONS

LD50 = >0.2 g/kg and <2 g/kg.

DATA QUALITY

No data available on GLP.

Information taken from test report.

Purity of the test substance/decomposition: not known.

REFERENCES

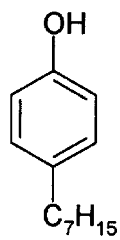
Biosearch Incorporated., P.O. Box 8598, Philadelphia, Pennsylvania 1910, USA. Acute Oral Toxicity in rats of the subject material. Project No. 82-3108A-1, 82-3108A-2 and 82-3108A.

13.2 ACUTE TOXICITY
DERMAL

TEST SUBSTANCE

Heptyl derivs (*p*-heptylphenol)

CAS No. 72624-02-3



METHOD

Similar to those proposed in 40 CFR, Section 163.81-2, Federal Register, August 22, 1978 and subsequently modified in accordance with the revised EPA Pesticide Assessment Guidelines of Nov 1982.
GLP: Data not available
Year study performed: 1985

Species: New Zealand White rabbit.

Sex: Males and females.

Remarks: The test article was dosed as supplied, at a dose level of 2.0 g/kg. A group of 10 rabbits (5 male and 5 female) with healthy intact skin was used. Approximately 24 hours before testing, the fur was clipped from the backs of the test animals. All rabbits were weighed and the correct amount of test article was applied to approximately 10% of the body surface on each animal. The treated area was covered with a large porous gauze patch and wrapped with an impervious material to ensure that the animals did not ingest the test article. The dressings were removed after 24 hours and any excess material removed, where practical, using water or an appropriate solvent. The animals were observed for a 14-day period for signs of toxicity (systemic and topical) and for mortality.

RESULTS

LD50: >2.0 g/kg.

Males – Signs of necrosis and severe oedema were observed in 5/5 animals after unwrapping at 24 hours. Eschar was noted in 3/5 animals at 48 hours and in 2/5 hours at 72 hours. The eschar began to peel at 7 days in 3/5 animals, at 8 days in 1/5 animals and at 9 days in 1/5 animals. Other than the above skin observations, all animals appeared normal throughout the 14-day observation period. A loss of body weight was noted in 1/5 animals at 7 and 14 days. There were no gross abnormalities noted in the animals necropsied at the conclusion of the 14-day observation period.

Females – Signs of necrosis and severe oedema were observed in 5/5 animals after unwrapping at 24 hours. Eschar was noted in 5/5 animals by 48 hours, which began to peel in 4/5 animals at 8 days and in 1/5 animals at 10 days. Other than a loss of body weight at 7 days, no adverse symptoms preceded the death of one animal on day 12. Other than the above skin observations, the remaining 4/5 animals appeared normal throughout the observation period. A loss of body weight was also noted in 2/5 animals at 7 days and in 1/5 of the remaining animals at 14 days. Diarrhoea, signs of dehydration and no formed faecal material in the lower gastrointestinal tract were noted in the animal found dead at 12 days. No gross abnormalities were noted in the animals necropsied at the conclusion at the 14-day observation period.

CONCLUSIONS

LD50 = > 2.0 g/kg.

DATA QUALITY

No data available on GLP.

Information taken from test report.

Purity of the test substance/decomposition: Not known.

REFERENCES

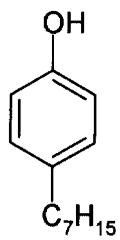
Biosearch Incorporated., P.O Box 8598, Philadelphia, Pennsylvania 1910, USA, Acute Dermal Toxicity , Single level - Rabbits. Project No. 85-4762A.

13.3 ACUTE TOXICITY
SKIN IRRITATION

TEST SUBSTANCE

Heptyl derivs (*p*-heptylphenol)

CAS No. 72624-02-3



METHOD

Similar to that described in Section 1500.41, Federal Hazardous Substances Act Regulations - 16 CFR – P.124.
GLP: Data not available
Year study performed: 1982

Species: New Zealand White rabbit

Remarks: A group of six New Zealand White rabbits was clipped over a wide area. One side of the animals' backs was abraded at one site with a lancet sufficiently deep to penetrate the stratum corneum but not enter the derma to produce bleeding. The skin of the other side was allowed to remain intact. A 0.5 ml portion of material was applied to an abraded and an intact skin site on the same rabbit. Gauze patches were then placed over the treated areas and an impervious material was wrapped snugly around the trunks of the animals to hold the patches in place. The wrapping was removed at the end of the twenty-four hour period and the treated areas were examined. Readings were also made after 72 hours. The Draize method of scoring was employed.

RESULTS

Intact and abraded skin:

Erythema and eschar formation – scorings indicate severe erythema (beet redness) to slight eschar formation (injuries in depth) at the 24 and 72 hour observation periods.

Oedema formation – scorings indicate that slight oedema (edges of area well defined by definite raising) was noted (24 hour period) reducing to very slight oedema at the 72 hour period.

CONCLUSIONS

Based on the Draize method of scoring the test material is classified as a primary skin irritant.

DATA QUALITY

No data available on GLP.

Information taken from test report.

Purity of the test substance/decomposition: Not known.

REFERENCES

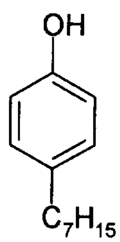
Biosearch Incorporated., P.O Box 8598, Philadelphia, Pennsylvania 1910, USA, Primary Skin Irritation - Rabbits. Project No. 82-3108A.

13.4 ACUTE TOXICITY
EYE IRRITATION

TEST SUBSTANCE

Heptyl derivs (*p*-heptylphenol)

CAS No. 72624-02-3



METHOD

Similar to that described in Section 1500.42, Federal Hazardous Substances Act Regulations - CFR 16 P. 125.	
GLP: Data not available	
Year study performed: 1982	

Species: Albino rabbit.

Remarks: Six healthy young adult albino rabbits were used in this study. 0.1 ml of the experimental material was instilled into the right eyes of the test animals while the other eyes remained untreated to serve as controls. The test material was not washed from the eyes. The treated eyes were examined at 1, 2, 3, 4, 7, 14, and 21 days following instillation of the test material into the eyes. Interpretation of the results was made in accordance with the Draize scale of scoring ocular lesions.

RESULTS

Using the Draize method of scoring the test material is classified as a primary ocular irritant.

CONCLUSIONS

The test material is classified as a primary ocular irritant.

DATA QUALITY

No data available on GLP.

Information taken from test report.

Purity of the test substance/decomposition: Not known.

REFERENCES

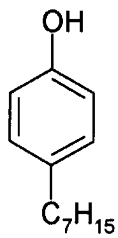
Biosearch Incorporated., Primary Eye Irritation - Rabbits. Project No. 82-3108A.

15.1 GENETIC TOXICITY IN VITRO (GENE MUTATION ASSAY)

TEST SUBSTANCE

Heptyl derivs (*p*-heptylphenol)

CAS No. 72624-02-3



METHOD

Ames, et al ., 1975; Bridges, 1972; Green and Muriel, 1976; Maron and Ames, 1983; Maron, et al., 1981
GLP: (N)
Year study performed: 1993

Species/strain: *Salmonella typhimurium* TA 1535, TA 1537, TA 1538, TA 98 and TA 100 and *Escherichia coli* WP2uvrA.

Metabolic activation: S-9 mix (with and without metabolic activation) 6% Aroclor 1254 – induced male rat liver and homogenate.

Test 1. *Salmonella* (5 strains) 0.05, 0.167, 0.5, 1.67, 5.0, 16.7 µg/plate (+/- S9)

E.coli 0.167, 0.5, 1.67, 5.0, 16.7, 50.0 µg/plate

Test 2. Repeat TA 1538 + S9 mix

Repeat 6 strains – S9 mix

TA 1535, 1537, 98 and 100: 1.67, 5.0, 16.7, 50.0, 167, 500 µg/plate with S9 mix

Test 3. TA 1535, 1537, 98 and 100 (+S9)

0.5, 1.67, 5.0, 16.7, 50 and 100 µg/plate

WP2uvrA: 0.167, 0.5, 1.67, 5.0, 16.7, 50.0 and 100 µg/plate (+S9)

Remarks: Strains were treated in the presence and absence of metabolic activation with the test substance dissolved in DMSO. Triplicate cultures of each strain were evaluated with the appropriate solvent in the presence and absence of S9 to serve as negative (solvent) controls

RESULTS

Test 1. The test article was found to be freely soluble at all doses evaluated. Inhibited growth was observed in all tester strains all doses of 0.500, 1.67, 5.00, 16.7 and/or 50.0 μg plate with S9, and in strain TA 1538 at doses of 5.0 and 16.7 μg/plate without S9. Revertant frequencies for all doses of the test substance in all tester strains with and without S9 approximated or were less than those observed in the concurrent negative control values.

Test 2. The test article again was found to be freely soluble at all doses evaluated, and inhibited growth was observed in all tester strains at the highest two or three doses evaluated with and without S9. Revertant frequencies for all doses of the test substance in all five salmonella tester strains with S9, and in all six-tester strains without S9, approximated or were less than control values. A statistically significant increase in revertant frequency, to approximately 2.6-fold control values, was observed in tester strain WP2uvrA at a dose of 1.67 μg/plate. However, this increase apparently was not dose dependant.

Test 3. The test article was found to be freely soluble at all doses evaluated, and inhibited growth was observed in all tester strains at doses of 16.7, 50.0 and/or 100 μg/plate with S9. Revertant frequencies for all doses of the test substance in tester strains TA 1535, TA 98, TA 100 and WP2uvrA approximated or were less than control values. A statistically significant increase in revertant frequency, to approximately 2.1-fold control values, was observed in tester strain TA 1537 at a dose of 16.7 μg/plate. However, this increase was not dose dependent. Thus, the slight increase observed in strains TA 1537 and WP2uvrA in the confirmatory assay or final retest is considered to be a statistical aberration due to random fluctuation of the spontaneous revertant frequencies. All positive and negative control values in all assays were within acceptable limits.

CONCLUSIONS

The test substance was considered to be non-mutagenic in this test system.

DATA QUALITY

Not a GLP study.

Information taken from test report.

Purity of the test substance/decomposition: not known.

REFERENCES

Pharmakon USA., P.O Box 609, Waverley, Pennsylvania 18471-0609, USA, PA, Ames/*Salmonella-E.coli* liquid pre-incubation assay on OS #43247H. PH 301-LU-023-93.

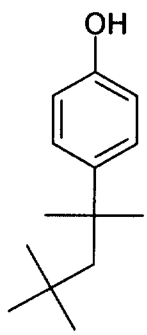
PHYSICAL/CHEMICAL ELEMENTS

1.1 MELTING POINT

TEST SUBSTANCE

p-tert-Octylphenol

CAS No. 140-66-9



METHOD

Method/guideline followed: information not available in database.

GLP (Y/N): no.

Year study performed: not known.

RESULTS

Melting point: 79 - 82°C.

CONCLUSIONS

The test substance has a melting point range of 79 - 82°C.

DATA QUALITY

Not a GLP study.

Information taken from IUCLID database.

Purity of the test substance / decomposition: information not available in database.

REFERENCES

Occupational Health Service Inc., New York (USA), Rev. 21.02.91 (CD-ROM). as cited in IUCLID database.

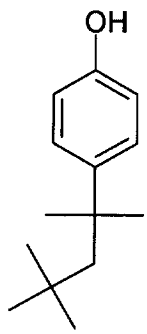
OTHER

2.1 BOILING POINT

TEST SUBSTANCE

p-tert-Octylphenol

CAS No. 140-66-9



METHOD

Method/guideline followed: information not available in database.

GLP (Y/N): no.

Year study performed: not known.

RESULTS

Boiling point: 280 - 283°C at 101300 Pa (760 mm Hg).

CONCLUSIONS

The test substance has a boiling point range of 280 - 283°C at 101300 Pa.

DATA QUALITY

Not a GLP study.

Information taken from IUCLID database.

Purity of the test substance / decomposition: information not available in database.

REFERENCES

Sax, Dangerous properties of Ind. Materials, 7th edition, 1989 as cited in IUCLID database.

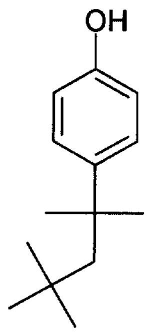
OTHER

3.1 VAPOUR PRESSURE

TEST SUBSTANCE

p-tert-Octylphenol

CAS No. 140-66-9



METHOD

Method/guideline followed: information not available in database.

GLP (Y/N): no.

Year study performed: 1989.

RESULTS

Vapour pressure: 0.21 Pa @ 20°C.

CONCLUSIONS

The test substance has a vapour pressure of 0.21 Pa @ 20°C.

DATA QUALITY

Not a GLP study.

Information taken from IUCLID database.

Purity of the test substance / decomposition: information not available in database.

REFERENCES

Huels-Produktdatenblatt "Octylphenol PT", Artikel-Nr. 002325, 1989 as cited in IUCLID database.

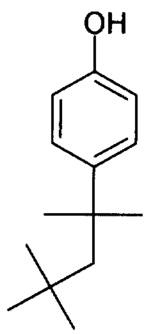
OTHER

4.1 PARTITION COEFFICIENT

TEST SUBSTANCE

p-tert-Octylphenol

CAS No. 140-66-9



METHOD

Method/guideline followed: OECD Guideline 107 "Partition Coefficient (n-octanol/water), Flask-shaking Method".

GLP (Y/N): no.

Year study performed: 1993.

RESULTS

Log Kow: 4.12 at 20.5°C.

CONCLUSIONS

The test substance has a log Kow of 4.12 at 20.5°C.

DATA QUALITY

Method follows OECD guideline. Temperature but not test substance purity given.

Information taken from IUCLID database.

REFERENCES

Ahel, M. and Giger, W.: Partitioning of alkylphenols and alkylphenol polyethoxylates between water and organic solvents. Chemosphere 26, 1471 – 1478 (1993) as cited in IUCLID Database.

OTHER

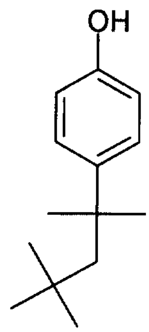
Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 (Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994).

5.1 WATER SOLUBILITY

TEST SUBSTANCE

p-tert-Octylphenol

CAS No. 140-66-9



METHOD

Method/guideline followed: generator column.

GLP (Y/N): yes.

Year study performed: 1984.

RESULTS

Water solubility: 17 – 19 mg/l at 22°C.

CONCLUSIONS

The solubility of the test substance in water is 17 – 19 mg/l at 22°C.

DATA QUALITY

GLP study.

Information taken from IUCLID database.

REFERENCES

Analytical Bio-Chemistry Laboratories, Inc.:7200 ABC Lane, P.O Box 1097, Columbia, Missouri 65205: Method validation and solubility of octylphenol in aquatic test waters, unpublished test report No. 31914, December 1984 as cited in IUCLID Database.

OTHER

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 (Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994).

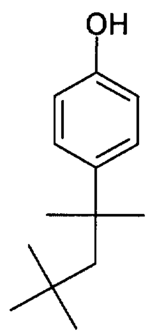
ENVIRONMENTAL FATE AND PATHWAY ELEMENTS

6.1 PHOTODEGRADATION

TEST SUBSTANCE

p-tert-Octylphenol

CAS No. 140-66-9



METHOD

Method/guideline followed: calculation using the programme AOPWIN v1.88.

Test type: calculation of the rate constant for the atmospheric reaction between photochemically produced hydroxyl radicals and the test substance in the vapour phase.

GLP (Y/N): no.

Year study performed: calculation made for this HPV submission.

RESULTS

Sensitizer: hydroxyl radical.

Overall hydroxyl rate constant: 42.4×10^{-12} cm^3/molecule-sec.

Half-life: 3.03 hours.

CONCLUSIONS

The programme estimates that in a typical atmosphere 50% of the test substance will undergo reaction in 3.03 hours.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. AOPWIN v 1.88.

OTHER

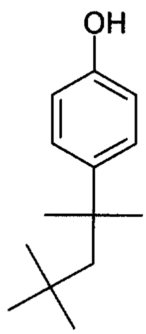
No experimental data was found on direct aqueous photolysis of the test substance. However, *p*-cresol, a related substance, in aqueous solution is reported as having a half-life of 35 days in sunlight (Smith, J.H. et al, "Environmental Pathways of Selected Chemicals in Freshwater Systems: Part II. Laboratory Studies," EPA-600/7-78-074, May 1978. Cited in Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, page 8-38.

7.1 STABILITY IN WATER

TEST SUBSTANCE

p-tert-Octylphenol

CAS No. 140-66-9



COMMENT

No abiotic hydrolysis studies were located.

The category phenols do not possess any functional groups that are regarded as being susceptible to hydrolysis under environmental conditions (Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, pages 7-4 and 7-5).

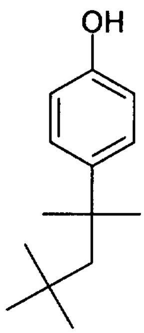
The software prediction programme HYDROWIN v1.66 cannot estimate hydrolysis rate constants for phenols.

8.1 TRANSPORT BETWEEN ENVIRONMENTAL COMPARTMENTS (FUGACITY)

TEST SUBSTANCE

p-tert-Octylphenol

CAS No. 140-66-9



METHOD

Test type: Calculation of partitioning between environmental compartments.

Year study performed: Model run for this HPV submission.

Model: Level 1 Fugacity-Based Environmental Partitioning Model v2.11.

Input values

Chemical specific

Molecular mass:	206
Data temperature (°C):	25
Water solubility (mg/l):	18
Vapour pressure (Pa):	0.21
Log Kow:	4.12
Melting point (°C):	80.5

Environmental conditions: defaults used.

RESULTS

Environmental compartment	Percentage of test substance
Air	3.61
Soil	86.9
Water	7.45
suspended sediment	0.060
fish	0.0049
Sediment	1.93

DATA QUALITY

The Mackay Level I Fugacity Model estimates the equilibrium distribution of a fixed quantity of a non-reacting chemical in a closed environment at equilibrium; with no degradation reactions and no flow or intermedia transport processes. The chemical is assumed to distribute instantaneously to an equilibrium concentration and therefore the medium receiving the emission is unimportant. This model is an aid to understanding the physical chemistry properties that are of greatest importance in determining the environmental distribution of substances; it is not a tool to predict actual or likely concentrations in a real environment.

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 and therefore their physical chemistry properties are unlikely to be affected by the pH values normally found in the environment.

REFERENCES

This software program is available with the publication: Mackay, D., Multimedia environmental models: the fugacity approach, Lewis Publishers Inc., Chelsea, MI, 1991.

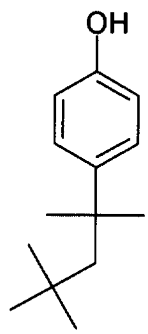
OTHER

9.1 BIODEGRADATION

TEST SUBSTANCE

p-tert-Octylphenol

CAS No. 140-66-9



METHOD

Method/guideline followed: OECD Guide-line 302 C "Inherent Biodegradability: Modified MITI Test (II)"

Test type: aerobic.

GLP (Y/N): no.

Year study performed: 1981.

Contact time: 28 days.

Innoculum: activated sewage sludge.

Concentration: information not available.

RESULTS

Percentage degradation: 0% after 28 days.

CONCLUSIONS

p-tert-Octylphenol was not inherently biodegradable under the conditions of the study.

DATA QUALITY

Not a GLP study.

Purity of test substance not specified.

Recognised study design used.

Information on test substance concentration not available.

REFERENCES

Safepharm Laboratories Ltd., P.O Box 45, Derby, DE1 2BT, U.K. Assessment of inherent biodegradability: Modified MITI (II), unpublished report No. S0052/E584, November 1991 as cited in IUCLID database.

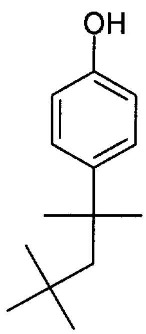
OTHER

9.2 BIODEGRADATION

TEST SUBSTANCE

p-tert-Octylphenol

CAS No. 140-66-9



METHOD

Method/guideline followed: BOD insoluble substances Test (ISO 10708, in preparation)

Test type: aerobic.

GLP (Y/N): yes.

Year study performed: 1991.

Contact time: 28 days.

Innoculum: non-adapted activated sewage sludge.

Concentration: 27.5 mg/l (related to test substance).

RESULTS

Percentage degradation: 20% after 28 days.

CONCLUSIONS

p-tert-Octylphenol was not readily biodegradable under the conditions of the study.

DATA QUALITY

GLP study.

REFERENCES

Huels-Bericht Nr. BO-91/5, 1991 (unveroeffentlicht) as cited in IUCLID database.

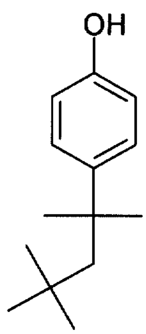
OTHER

10.1 ACUTE TOXICITY TO FISH

TEST SUBSTANCE

p-tert-Octylphenol

CAS No. 140-66-9



IUCLID Identification Number: 140-66-9

Purity of the test substance stated as 99.34%.

METHOD

American Public Health Association. 1980. Standard Methods for the Examination of Water and Wastewater. 15th ed. Washington, DC. 1134 p. Committee on Methods for Toxicity Tests with Aquatic Organisms (C. E. Stephan, Chairman). 1975. Methods for Acute Toxicity Tests with Fish, Macroinvertebrates and Amphibians. Environmental Protection Agency, Ecological Research Series EPA-660/3-75-009, April, 1975. 61 p.
Test type: 96-hour flow-through toxicity test
GLP: (Y)
Year study performed: 1984

Species: fathead minnow (*Pimephales promelas*)

Analytical procedures: The concentrations of octylphenol in water were determined by extraction and HPLC methods on days 0 and 4 of the study.

Test substance preparation: A proportional diluter system was used for the intermittent introduction of octylphenol and diluent water into the test aquarium. Parameters of temperature, dissolved oxygen and pH were measured at 0, 48 and 96 hours in the control, low and high test concentrations with remaining fish at the time of sampling:

Temperature	15 – 20°C
Dissolved oxygen	9.2 – 10.2 ppb
pH	7.8 – 8.3
Hardness ($CaCO_3$)	225 – 275 ppm

A diluter stock of 14,500 mg/l in acetone was prepared of the test compound for the definitive study.

The test was initiated by stratified random assignment of 20 fathead minnow to each test aquarium after the test solutions had been flowing through the aquarium for at least 24 hours. A control received 0.1 ml of acetone that was equivalent to that received in the highest test concentration.

Exposure period: 96 hours

Statistical methods: Binomial Method

Moving Average Method

Probit Method

RESULTS

Nominal concentrations: 0.047, 0.091, 0.18, 0.39 and 0.70 mg/l.

Mean measured concentrations: 0.041, 0.077, 0.15, 0.34 and 0.63 mg/l. These values ranged from 83 to 90% of nominal concentration.

LC50 values with 95% confidence limits and no-observed effect concentration, based on mean measured concentrations:

LC50(24hr) 0.29 mg/l (0.15 – 0.63 mg/l)

LC50 (48hr) 0.25 mg/l (0.15 – 0.34 mg/l)

LC50 (72hr) 0.25 mg/l (0.15 – 0.34 mg/l)

LC50 (96hr) 0.25 mg/l (0.15 – 0.34 mg/l)

NOEC (24hr) 0.15 mg/l

NOEC (48hr) 0.077 mg/l

NOEC (72hr) 0.077 mg/l

NOEC (96hr) 0.077 mg/l

The fish were observed for mortality and abnormal effects daily for the 96-hour test period. Abnormal effects monitored included surfacing, loss of equilibrium, colour changes, erratic swimming and lying on the bottom of the chamber. Mortality, surfacing, loss of equilibrium, dark discolouration and/or quiescence were observed in level 3, 4 and 5 during the 96 hour study.

Nominal concentration (mg/l)	% Mortality Hours of Exposure			
	24	48	72	96
Solvent control	0	0	0	0
(Level 1) 0.047	0	0	0	0
(Level 2) 0.091	0	0	0	0
(Level 3) 0.18	0	0	0	0
(Level 4) 0.39	65	90	90	90
(Level 5) 0.70	100	100	100	100

CONCLUSIONS

Based on the lack of mortality and abnormal effects, the results indicated a 96-hour LC50 and 95% confidence interval of 0.25 mg/l (0.15 – 0.34 mg/l) and a no-observed effects concentration of 0.077 mg/l for octylphenol.

Remarks: The primary objective of this study was to define the acute toxicity of octylphenol by determining the LC50's during the course of the test. A second objective of the study was to provide a lethal threshold (incipient LC50) for either fathead minnow (*Pimephales promelas*) or rainbow trout (*Salmo gairdneri*) depending on which was the single most sensitive species. It was concluded that the rainbow trout appeared to be the more sensitive species; therefore the fathead minnow study was terminated after 96 hours (see below). However, a lethal threshold appeared to be reached after 48 hours and was estimated to be 0.25 mg/l.

DATA QUALITY

GLP study

Information taken from the test report.

REFERENCES

Dynamic 96-Hour Acute Toxicity of Octylphenol to Fathead Minnows (*Pimephales promelas*). Final Report # 31910

OTHER

Results of the dynamic 14-day rainbow trout study- LC50s with their 95% confidence interval and no observed effect concentrations:

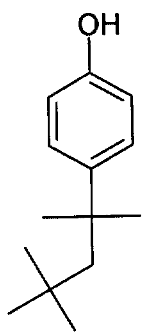
LC50(1day) 0.45 mg/l (0.32– 0.71 mg/l)	NOEC(1day) 0.17 mg/l
LC50(2days) 0.37 mg/l (0.17– 0.71 mg/l)	NOEC(2day) 0.17 mg/l
LC50(3days) 0.24 mg/l (0.17– 0.32 mg/l)	NOEC(3day) 0.17 mg/l
LC50(4days) 0.21 mg/l (0.17 –0.32 mg/l)	NOEC(4day) 0.17 mg/l
LC50(5days) 0.20 mg/l (0.084 –0.32 mg/l)	NOEC(5day) 0.17 mg/l
LC50(6days) 0.17 mg/l (0.084 –0.32 mg/l)	NOEC(6day) 0.17 mg/l
LC50(7-8days) 0.14 mg/l (0.084 –0.17 mg/l)	NOEC(7-8day) 0.17 mg/l
LC50(9days) 0.13 mg/l (0.084 –0.17 mg/l)	NOEC(9day) 0.17 mg/l
LC50(10-14day) 0.12 mg/l (0.084 –0.17 mg/l)	NOEC(10-14day) 0.17 mg/l

10.2 EARLY LIFE STAGE TEST

TEST SUBSTANCE

p- tert-Octylphenol

CAS No. 140-66-9



IUCLID Identification Number: 140-66-9

Purity of the test substance given as 99.22%

METHOD

Proposed Recommended Bioassay Procedure for Egg and Fry Stages of Fresh Water Fish. ASTM Standard Practice for Conducting Toxicity Tests on the Early Life Stages on Fish.
Test type: 60 day flow-through post-hatch early life stage toxicity test
GLP: (Y)
Year study performed: 1986

Species: Rainbow trout *Salmo gairdneri*

Analytical procedures: The actual concentration of octylphenol was measured by extraction and HPLC method.

Test substance preparation: A two-liter proportional diluter system was used for the intermittent introduction of an acetone solution of octylphenol to four replicate test chambers per concentration. Flow-splitting cells divided each of the five test concentrations, acetone solvent control and control solutions into the respective replicate test chambers. Aerated well water was delivered to the glass aquarium at an average rate of approximately 50 ml/minute per replicate.

Water quality parameters were measured at day 0, 1 and on every 7th day during the study:

Temperature:	15- 20 °C
Dissolved oxygen:	9.21 – 10.1 ppm
pH:	7.8 – 8.3
Hardness ($CaCO_3$):	225 – 275 ppb
Alkalinity ($CaCO_3$):	325 – 375 ppb
Exposure period:	60 days

Statistical methods: The statistical data were analysed by Systat® computer program (Version 2.1). Growth data, using the individual per replicate, were analysed using two-way analysis of variance with an interaction model. One-way analysis of variance (ANOVA) calculations were used to determine whether significant difference existed between the controls and treatment levels, followed by Tukey's HSD multiple means comparison test.

RESULTS

Nominal concentrations: 0.0062, 0.012, 0.025, 0.050 and 0.10 mg/l.

Mean measured concentrations: 0.0061 (± 0.0024), 0.011 (±0.0025), 0.022 (±0.0046), 0.051 (±0.0078) and 0.091 (±0.0079) mg/l. Values ranged from 96 to 125% of nominal concentrations.

MATC (Maximum Acceptable Toxicant Concentration): 0.0061 – 0.011 mg/l

NOEL 0.0061 mg/l

Morphological and behavioural abnormalities of quiescence, curvature of the spine and loss of equilibrium occurred consistently in the highest three test concentrations prior to mortality. Surfacing and erratic swimming were occasionally noted before mortality occurred.

Hatchability of rainbow trout eggs after 20 days of continuous exposure to the test substance was not significantly affected when compared to control. Survival of fry between hatch and 60 days of exposure to the three highest test concentrations was significantly reduced when compared to control.

Rainbow trout fry growth was significantly reduced after 35 and 60 days of exposure to the four highest test concentrations. Growth of trout fry, as measured by wet weight after 60 days of exposure, was significantly reduced in the three highest test concentrations.

CONCLUSIONS

The maximum acceptable toxicant concentration of the test substance was found to be greater than 0.0061 mg/l and lower than 0.011 mg/l.

DATA QUALITY

GLP study

Information taken from the test report.

REFERENCES

Early Life Stage Toxicity of *para-tert*-octylphenol to Rainbow Trout (*Salmo gairdneri*) in a Flow-Through System.

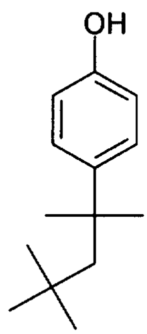
Final Report #34452, Analytical Bio-Chemistry Laboratories, Inc, 7200 ABC Lane, P.O Box 1097, Columbia, Missouri 65202, USA.

10.3 ACUTE TOXICITY TO FISH

TEST SUBSTANCE

p-tert-Octylphenol

CAS No. 140-66-9



IUCLID Identification Number: 140-66-9

METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed:2000

Species: Fish

Exposure period: 96 hours, 30 days and 90 days

RESULTS

LC50 (96hr) 0.29 mg/l

ChV(30 day) 0.041 mg/l

ChV (90 day) 0.008 mg/l

Remark: log Kow used 5.28 (calculated value)

CONCLUSIONS

Estimated LC50 (96hr) for the test substance was found to be 0.29 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v.0.99e

OTHER

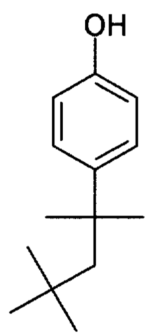
Calculation performed for this HPV submission.

11.1 TOXICITY TO AQUATIC PLANTS (E.G., ALGAE)

TEST SUBSTANCE

p- tert- Octylphenol

CAS No. 140-66-9



IUCLID Identification Number: 140-66-9

The sample of the test substance was high purity grade.

METHOD

Based on: Miller, W. E., J. C. Greene and T. Shiroyama. July 1978. The *Selenastrum capricornutum* Printz Algal Assay Bottle Test. Experimental Design, Application and Data Interpretation Protocol. Special Studies Branch, Corvallis Environmental Research laboratory, Corvallis, Oregon 97330. EPA-600/9-78-018 OTS Algal Acute Toxicity Test, August 1982. EG-8, ES-5 ASTM Proposed Standard practice for conducting short-term toxicity tests with fresh water and salt water algae. E-47.01, Draft 5, March 1983
Test type: 96-hour static algal assay
GLP: (Y)
Year study performed: 1984

Species: Green algae - *Selenastrum capricornutum* Printz

Exposure period: 96 hours, from 6th to 10th September

Test substance preparation: An initial definitive stock solution of octylphenol was made by weighing 100 mg into a 10 ml volumetric flask and diluting with triethylene glycol. Appropriate additions were made of the stock solution with triethylene glycol so that 0.1 ml total triethylene glycol was added to each test flask, which gave the appropriate test concentrations.

Analytical procedures:

Statistical methods:

Stephan, C. E., K. A. Busch, R. Smith, J. Burke and R. W. Andrews. 1978. A computer program for calculating an LC50. U.S. Environmental Protection Agency, Duluth, Minnesota.

One-way analysis of variance (ANOVA).

Multiple means comparison test (Fischer's LSD).

The test vessels were incubated for 96 hours at 24 - 25°C under "cool-white" fluorescent light and constant shaking. Light intensity was maintained at 400 ± 10% ft-c and shaker speed was 100 rpm. Temperature and light readings measured throughout the test were within acceptable limits. Log phase growth was confirmed at 96 hours with a count of 9×10^5 cells/ml in the control. A 96-hour range-finding study was conducted to determine the concentration range in the definitive study. The flasks were prepared in triplicate for each test concentration, solvent control and control.

RESULTS

Nominal concentrations: 1.0, 1.8, 3.2, 5.6 and 10 mg/l

EC50 value with 95% confidence limits and no-effect level :

EC50 (96hr) 1.9 mg/l (1.0 – 2.7 mg/l)

NOEC (96hr) < 1.0 mg/l

CONCLUSIONS

The one-way ANOVA results indicated a 96-hour, no observed effect concentration of less than 1.0 mg/l. All test concentrations were significantly different from the control ($\alpha = 0.05$).

DATA QUALITY

GLP study

Information taken from the test report.

REFERENCES

Acute Toxicity of Octylphenol to *Selenastrum capricornutum* Printz. Analytical Bio-Chemistry Laboratories, Inc, 7200 ABC Lane, P.O Box 1097, Columbia, Missouri 65202, USA.

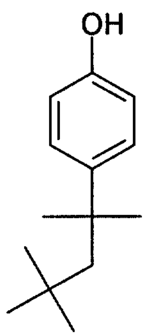
Static acute bioassay report # 31913

11.2 TOXICITY TO AQUATIC PLANTS (E.G., ALGAE)

TEST SUBSTANCE

p- tert- Octylphenol

CAS No. 140-66-9



IUCLID Identification Number: 140-66-9

METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Green algae

Exposure period: 96 hours

RESULTS

EC50 (96hr) 0.13 mg/l

ChV (96hr) 0.085 mg/l

Remarks: log Kow used 5.28 (calculated value)

CONCLUSIONS

Estimated EC50 (96hr) for the test substance was found to be 0.13 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v.0.99e

OTHER

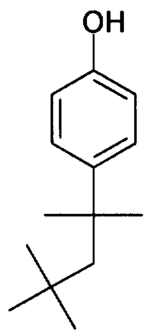
Calculation performed for this HPV submission.

12.1 ACUTE TOXICITY TO AQUATIC INVERTEBRATES (E.G., DAPHNIA)

TEST SUBSTANCE

p- tert- Octylphenol

CAS No. 140-66-9



IUCLID Identification Number: 140-66-9

Purity of the test substance stated as 99.34%.

METHOD

American Public Health Association. 1975. Standard Methods for the Examination of Water and Wastewater. 14th ed. Washington, DC. 1193 p. Committee on Methods for Toxicity Tests with Aquatic Organisms (C. E. Stephan, Chairman). 1975. Methods for Acute Toxicity Tests with Fish, Macroinvertebrates and Amphibians. Environmental Protection Agency, Ecological Research Series EPA-660/3-75-009, April, 1975. 61 p.
Test type: 48-hour flow-through toxicity test
GLP: (Y)
Year study performed: 1984

Species: *Daphnia magna*

Analytical procedures: The concentrations of octylphenol in water were determined by extraction and HPLC on days 0 and 2 of the study.

Test substance preparation: A proportional diluter system was used for the intermittent introduction of octylphenol and diluent water into the test chambers. The system contained seven sets of four replicate one-litre test chambers designated as control, solvent control and level 1 through level 5. Flow-splitting chambers were utilised to thoroughly mix and divide each octylphenol concentrations for delivery to the test chambers. Water quality parameters of temperature, dissolved oxygen and pH were measured at 0 and 48 hours in the control, low and high test concentrations with remaining daphnids:

Temperature	15 – 20°C
Dissolved oxygen	9.2 – 10.2 ppb
pH	7.8 – 8.3
Hardness ($CaCO_3$)	225 – 275 ppm

A diluter stock of 24800 mg/l in acetone was prepared of the test compound for the definitive study.

Statistical methods: Binomial Method

Moving Average Method

Probit Method

RESULTS

Nominal concentrations: 0.072, 0.12, 0.25, 0.43 and 1.0 mg/l.

Mean measured concentrations: 0.063, 0.11, 0.19, 0.32 and 0.94 mg/l. These values ranged from 74 to 94% of nominal concentrations.

LC50 values with 95% confidence limits based on mean measured concentrations:

LC50 (24hr) 0.26 mg/l (0.19 – 0.32 mg/l)

LC50 (48hr) 0.27 mg/l (0.19 – 0.32 mg/l)

NOEC (48hr) 0.11 mg/l

The daphnids were observed for mortality and abnormal effects daily for the 48-hour test period. Abnormal effects monitored included surfacing, quiescence, loss of equilibrium, clumping of the daphnids together and lying on the bottom of the test chamber. Mortality, quiescence and/or daphnids on the bottom of the test chamber were observed in the 0.19, 0.32 and 0.94 mg/l test concentrations after 48 hours. The difference in the 24 and 48 hour survival of the 0.32 mg/l test concentration (90 and 82% respectively) was due to the recovery of 3 daphnids that appeared dead after 24 hours.

CONCLUSION

Based on the lack of mortality and abnormal effects, the results indicated a 48-hour no- observed effect concentration of 0.11 mg/l for octylphenol.

DATA QUALITY

GLP study

Information taken from the test report.

REFERENCES

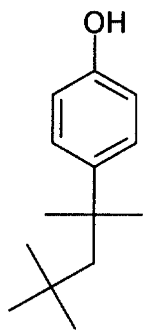
Dynamic 48-Hour Acute Toxicity of Octylphenol to *Daphnia magna*. Final Report # 31912

12.2 CHRONIC TOXICITY TO AQUATIC INVERTEBRATES (E.G., DAPHNIA)

TEST SUBSTANCE

p- tert- Octylphenol

CAS No. 140-66-9



IUCLID Identification Number: 140-66-9

Purity of the test substance given as 99.34%.

METHOD

American Society for Testing and Materials. 1981. Proposed Standard Practice for Conducting *Daphnia magna* Chronic Toxicity Tests in Flow-Through Systems. Draft No. 3, 1981. Methods for Acute Toxicity Tests with Fish, Macroinvertebrates and Amphibians. EPA, Ecological Research Series EPA-660/3-75-009, 1975. 61p. U. S. EPA 1976. TSCA. Public Law 94- 469. Federal Register, 1976. 2003 – 20521
Test type: Flow though toxicity test
GLP: (Y)
Year study performed: 1988

Species: *Daphnia magna*

Exposure period: 21 day

Analytical procedures: The concentrations of the test substance in water were determined by HPLC on days 0, 4, 7, 14 and 21.

Test substance preparation: A proportional diluter system was used for the intermittent introduction of octylphenol and diluent water into the test chambers. The system contained seven sets of four replicate (total of 40 daphnids) one-litre test chambers designated as control, solvent control, and level 1 through level 5. Flow-splitting chambers were utilised to thoroughly mix and divide each octylphenol concentration for delivery to the test chambers. Aerated water was delivered to each chamber at an average rate of 4.1 ml/min.

Water quality parameters of dissolved oxygen and pH were measured at day 0, 4, 7, 14 and 21.

Temperature: 20°C

Dissolved oxygen: 7.5 – 9 ppb

pH: 7.8 – 8.3

TOC and suspended solids (routinely analysed on a monthly basis):

Hardness ($CaCO_3$): 206 – 275 ppm

Alkalinity ($CaCO_3$): 224 – 336 ppm

TOC: 1.4 ppm (0.9 – 2.8 ppm)

Suspended solids: 0- 1.3 ppm

All stock solutions were corrected for compound purity and prepared in acetone.

Statistical methods:

One-way analysis of variance (ANOVA)

Multiple means comparison test

Dunnett C. W. 1985. A Multiple Comparison Procedure for Comparing Several Treatments with a Control. J. Amer. Stat. Assoc. 50: 1096- 1121

Stephan C. E., K. A. Busch, R. Smith, J. Burke and R. W. Andrews. 1978. A computer Program for Calculating an LC50. U.S. EPA, Duluth , Minnesota, pre-publication manuscript 1978.

Stephan, C. 1977. Methods for calculating an LC50, p. 65-84. In F. L. Mayer and J. L. Hamelink. Aquatic Toxicology and Hazard Evaluation. ASTM Special Technical Publication 643. ASTM Philadelphia.

RESULTS

Nominal concentrations: 0.030, 0.060, 0.12, 0.25 and 0.50 mg/l

Mean measured concentrations: 0.037, 0.062, 0.12, 0.23 and 0.51 mg/l. These values ranged from 92 to 123% of nominal concentrations.

EC50 (21day) 0.34 mg/l

MATC >0.037 and< 0.062 mg/l

Statistical analysis of survival for *Daphnia magna* after a 21-day exposure to octylphenol indicated that daphnid survival was significantly different ($P \leq 0.05$) from the pooled controls in the mean measured concentration of 0.51 mg/l. All daphnids had died in the 0.51 mg/l test level by day 9 of the study. Therefore, no reproduction and length data were available for further statistical analysis. A day 21 EC50 was calculated to be 0.34 mg/l.

The mean young/adult/ reproduction day after 21 days were significantly affected in the mean measured exposure levels of 0.12 and 0.23 mg/l of octylphenol.

The daphnid lengths in the octylphenol mean measured concentrations of 0.062, 0.12 and 0.23 mg/l were significantly different from the pooled controls. Length measurements could not be made on the 0.51 mg/l test levels, since all daphnids had died by day 9.

Mean measured concentration (mg/l)	Mean % Survival	Mean adult length (mm)	Mean young/adult reproduction day
Control	98	3.80	5.0
Solvent control	95	3.77	4.9
Pooled control	96	3.79	5.0
(Level 1) 0.037	100	3.74	4.9
(Level 2) 0.062	95	3.69	4.6
(Level 3) 0.12	100	3.64	3.4
Level 4) 0.23	100	3.43	2.5
(Level 5) 0.51	0*	*	*

* All daphnids had died by day 9 of the study.

CONCLUSIONS

The study accurately estimates the toxicity of octylphenol to *Daphnia magna.* Statistically the data identifies the MATC limits for the test substance as >0.037 and < 0.062 mg/l. These limits represent the worst case estimate. Since the mean adult length of the 0.062 mg/l test concentrations is only 2.6% less than the pooled control, the statistical difference indicated may not be biologically significant. This is supported by the fact that the reproduction data did not identify an effect at this level. Therefore, a case can be made that based on biological effects, a more conservative MATC of > 0.062 and < 0.12 mg/l may be more appropriate.

DATA QUALITY

GLP study

Method follows EPA/TSCA guideline.

Information taken from the test report.

REFERENCES

Chronic Toxicity of Octylphenol to *Daphnia magna* Under Flow-Trough Test Conditions

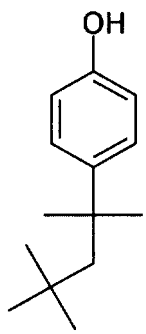
Study Number 36195

12.3 ACUTE TOXICITY TO AQUATIC INVERTEBRATES (E.G., DAPHNIA)

TEST SUBSTANCE

p- tert- Octylphenol

CAS No. 140-66-9



IUCLID Identification Number: 140-66-9

METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Daphnid

Exposure period: 48 hours, 21 days

RESULTS

LC50 (48hr) 0.51 mg/l

ChV (21day) 0.032 mg/l

Remark: log Kow used 5.28 (calculated value)

CONCLUSIONS

Estimated LC50 (48hr) for the test substance was found to be 0.51 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v. 0.99e

OTHER

Calculation performed for this HPV submission.

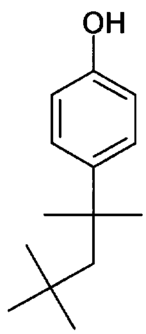
HEALTH ELEMENTS

13.1 ACUTE TOXICITY
ORAL

TEST SUBSTANCE

p-tert-Octylphenol

CAS No. 140-66-9



IUCLID Identification Number: 140-66-9

METHOD

OECD Guideline No. 401
GLP: (Y)
Year study performed: 1991

Species: Sprague-Dawley strain rat.

RESULTS

LD50: >2000 mg/kg

CONCLUSIONS

The test substance has not been classified in the Acute Oral Toxicity Test.

LD50: >2000 mg/kg.

DATA QUALITY

Performed according to OECD guidelines and GLP.

Information taken from IUCLID database.

Purity of the test substance / decomposition: Information not available in database.

REFERENCES

IUCLID database

SafePharm Laboratories Ltd., P.O Box No. 45, Derby, DE1 2BT, U.K. phenol, (4-(1,1,3,3-tetramethylbutyl): range-finding acute oral toxicity test in the rat. Unpublished report project No. 47/1578, March 1991.

OTHER

Sandoz Chemikalien AG, Muttenz (CH).

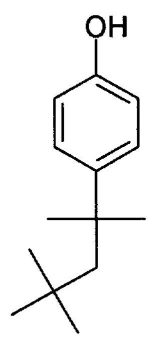
Huels AG Marl.

13.2 ACUTE TOXICITY
INHALATION

TEST SUBSTANCE

p-tert-Octylphenol

CAS No. 140-66-9



IUCLID Identification Number: 140-66-9

METHOD

Method/guideline followed: Information not available in database
GLP: (N)
Year study performed: 1973

Species: albino rat.

No of animals per dose: 6 adult rats.

Route of administration: Inhalative exposure.

Remarks: Test substance:	p-tert-octylphenol	-	89%	
o-tert-octylphenol	-	2%		
dioctylphenol	-	5%		
other isomers	-	3%		
phenol	-	1%		

RESULTS

Inhalative exposure of 6 adult albino rats at a concentration of 116 mg/l for one hour caused death of all animals within 24 hours:

Observations: Respiratory distress.

Gross autopsy: Pulmonary haemorrhage.

CONCLUSIONS

Inhalative exposure of 6 adult albino rats at a concentration of 116 mg/l for one hour caused death of all animals within 24 hours:

DATA QUALITY

Not a GLP study.

Information taken from IUCLID database.

REFERENCES

IUCLID database

Rohm & Haas Co., 1973.

EPA/OPTS Public File 878213508, microfiche no.: 0205842.

OTHER

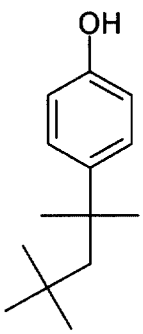
Source: Huels AG Marl.

13.3 ACUTE TOXICITY
DERMAL

TEST SUBSTANCE

p-tert-Octylphenol

CAS No. 140-66-9



IUCLID Identification Number: 140-66-9

METHOD

Method/guideline followed: Information not available in database
GLP: (N)
Year study performed: 1981

Species: Rabbit.

Remarks: Test substance:- purity ca 95%.

RESULTS

LD50: >2000 mg/kg.

CONCLUSIONS

The test substance has not been classified in the Acute Dermal Toxicity Test.

LD50: >2000 mg/kg.

DATA QUALITY

Not a GLP study.

Information taken from IUCLID database.

REFERENCES

IUCLID database.

BASF AG, dept of toxicology, unpublished data, (79/298), 01-12-81.

OTHER

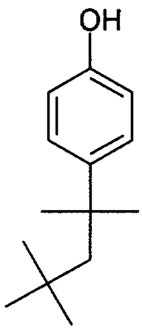
Source: BASF AG Ludwigshafen.

13.4 ACUTE TOXICITY
SKIN IRRITATION

TEST SUBSTANCE

p-tert-Octylphenol

CAS No. 140-66-9



IUCLID Identification Number: 140-66-9

METHOD

OECD Guidelines No. 404
GLP: (Y)
Year study performed: 1991

Species: New Zealand White rabbits.

Sex: 2 males, 1 female.

RESULTS

Erythema/Eschar formation: total scores after:

24 h = 372 h = 2

Oedema formation: total scores after:

24 h = 2

72 h = 0

The test material produced a primary irritation index of 1.2 and was classified as a mild irritant to rabbit skin according to the Draize classification scheme. No corrosive effects were noted.

CONCLUSIONS

Classified as a mild irritant to rabbit skin according to the Draize classification scheme and a non-irritant according to EEC labelling regulations.

DATA QUALITY

Performed according to OECD guidelines and GLP.

Information taken from IUCLID database and test report.

Purity of the test substance/decomposition: information not available in database.

REFERENCES

SafePharm Laboratories., P.O Box No. 45, Derby, DE1 2BT, U.K. acute dermal irritation test in the rabbit. Unpublished report, project No. 47/1579, Feb 1991 as cited in the IUCLID database.

OTHER

SIDS Dossier on the HPV P3 Chemical 140-66-9 Phenol, 4-(1,1,3,3-tetramethylbutyl)-, June 1993, received from Sandoz Chemikalien AG, Muttenz (CH).

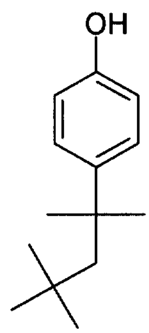
Huels AG Marl.

13.5 ACUTE TOXICITY
EYE IRRITATION

TEST SUBSTANCE

p-tert-Octylphenol

CAS No. 140-66-9



IUCLID Identification Number: 140-66-9

METHOD

OECD Guidelines No. 405
GLP: (Y)
Year study performed: 1991

Species: New Zealand White Rabbits.

RESULTS

A single application of the test material to the non-irrigated eye of one rabbit produced areas of translucent corneal opacity, iridial inflammation and severe conjunctival irritation. Other adverse ocular reactions noted were white appearance of the nictitating membrane, sloughing of the conjunctival surface, haemorrhage of the conjunctival membrane and blood stained discharge.

CONCLUSIONS

The test material was considered to be at least a severe irritant (Class 6 on a 1 to 8 scale) to the rabbit eye according to a modified Kay and Calandra classification system (based on one rabbit only). The test material was also considered to be an irritant according to EEC labelling regulations.

DATA QUALITY

Performed according to OECD guidelines and GLP.

Information taken from IUCLID database.

Purity of the test substance/decomposition: information not available in database.

REFERENCES

SafePharm Laboratories Ltd., P.O Box No 45, Derby, DE1 2BT, U.K. Phenol, 4-(1,1,3,3-tetramethylbutyl): acute eye irritation test in the rabbit. Unpublished report, project No. 47/1580, Feb 1991 as cited in the IUCLID database.

OTHER

SIDS Dossier on the HPV P3 Chemical 140-66-9 Phenol, 4-(1,1,3,3-tetramethylbutyl)-, June 1993, received from Sandoz Chemikalien AG, Muttenz (CH).

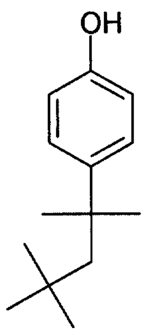
Huels AG Marl.

13.6 ACUTE TOXICITY
SKIN SENSITISATION

TEST SUBSTANCE

p-tert-Octylphenol

CAS No. 140-66-9



IUCLID Identification Number: 140-66-9

METHOD

OECD Guidelines No. 406
GLP: (N)
Year study performed: 1988

Species: Guinea-pig.

Remarks: Test substance = p-substituted octylphenol.

Challenge concentration: 20% in corn oil.

RESULTS

0/20 animals showed sensitisation 24 or 48 hours after the patch test.

CONCLUSIONS

The test material is not classified as a sensitiser.

DATA QUALITY

Performed according to OECD guidelines. Not a GLP study.

Information taken from IUCLID database.

Purity of the test substance/decomposition: Information not available in database.

REFERENCES

IUCLID database

Huels report No. 1197, 1988 (unpublished).

OTHER

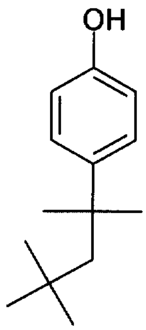
Source: Huels AG Marl.

15.1 GENETIC TOXICITY IN VITRO (GENE MUTATION)

TEST SUBSTANCE

p-tert-Octylphenol

CAS No. 140-66-9



METHOD

Method: Directive 84/449/EEC B.14 "Other effects – Mutagenicity(*Salmonella typhimurium* – reverse mutation assay)
Type: Reverse mutation assay
System of testing: Bacterial Plate incorporation
GLP: (Y)
Year study performed: 1984

Species/strain: *Salmonella typhimurium* TA 98, TA 100, TA 1537, TA 1538.

Metabolic activation: S9 mix (with and without).

Concentrations tested: 0 – 5000 μg/plate.

RESULTS

The test substance did not induce any significant mutations in the test system.

CONCLUSIONS

The test substance is considered to be non mutagenic.

DATA QUALITY

Performed according to EU guidelines. GLP study.

Information taken from IUCLID database.

Purity of the test substance/decomposition: Information not available in database.

REFERENCES

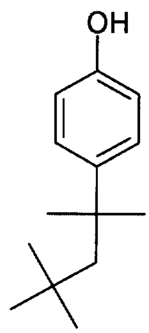
IUCLID database. Huels Report No. AM-91/11, 1991 (unpublished).

16.1 REPEATED DOSE TOXICITY
3 MONTHS DIETARY

TEST SUBSTANCE

p-tert-Octylphenol

CAS No. 140-66-9



IUCLID Identification Number: 140-66-9

METHOD

Method/guideline followed: Information not available in database, similar to EPA Health Effects Testing Guidelines
GLP: (N)
Year study performed: 1982

Species/strain: Rat BOR/WISW (SPF Cpb).

No. of rats per sex per dose: 10 rats/sex/dose.

Route of administration: Oral feed.

Sex: Males and females.

Exposure Period: 3 months.

Dose/Concentration: 0, 30, 300 and 3000 ppm.

Frequency of treatment: Daily.

Control group and treatment: Yes, concurrent no treatment.

Post exposure observation period: None.

Test Conditions: Twenty rats (10 females and 10 males) were used for the control and each of the three treatment groups. The animals were exposed to the test substance for 90 days. Treatment effects were determined by statistical comparison of mortality, body weight changes, food and water consumption, organ weight changes, clinical chemistry, haematology and histological evaluation of tissues from sacrificed animals. Although the study was conducted prior to the issuance of EPA's Health Effects Testing Guidelines, it closely follows the guidelines. The test procedures, including animal and dose selection, exposure conditions, observations, test substance administration, haematology, clinical chemistry, urinalysis and gross necropsy were in accordance with the testing guidelines.

RESULTS

NOAEL = 30 ppm.

LOAEL = 300 ppm.

Histologic examinations were conducted on only five animals per sex from the high dosage group as opposed to the ten animals per sex suggested in the EPA guidelines. However, the lack of a treatment-related effect in the high exposure group strongly suggests that treatment-related effects would not have been observed if all of the animals had been evaluated.

Throughout the study, no clinical signs of toxicity were observed. Furthermore, no significant reduction in food consumption was observed in either sex at any dosage level. A 28% increase in water consumption was noted in female rats exposed to the high dosage level. However, this effect was not observed in the male rats at any dosage level.

In both sexes, mean body weight gain was significantly reduced in the high dose animals. In females exposed at the high dosage, the heart weight was decreased and the brain weight was increased. The kidney, testes and brain weight were increased in males exposed at the high dosage level. In addition, males exposed to 300 ppm of the test substance experienced an increase in brain weight. Relative brain weight was the only dose –related organ weight change that was statistically significant.

Haematologic parameters in all treated male rats were unaffected by exposure to the test substance. A decrease in haemoglobin and haematocrit was observed among female rats in the high dosage group. Although thyroxin concentration in female rats at the high dose level was increased after one month, thyroxin concentration was not significantly elevated following three months of exposure. The increase at one month was attributed to elevated values in two female rats. Since no increase in thyroxin values was noted at three months and no histopathologic findings were observed in the thyroid gland, the increased thyroxin values were not considered to be toxicologically significant. All other findings were either not significantly different from controls, not dosage-related, or were within the normal range for animals in this age group.

At the gross necropsy no treatment-related abnormalities were observed. In addition, no treatment-related histopathologic observations were noted.

CONCLUSIONS

NOAEL = 30 ppm.

The results from this study demonstrate that high level exposure to the test substance produces low level toxic effects.

DATA QUALITY

Not a GLP study.

Information taken from the IUCLID database and report.

Test substance p-substituted octyl (purity 93.1%).

REFERENCES

IUCLID

Bayer report No. 10733, 1982 EPA/OPTS Public file 878213507, microfiche no.: 0205841.

OTHER

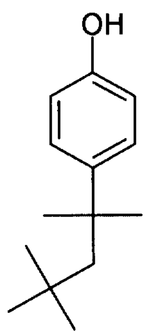
Source: Huels AG Marl.

16.2 REPEATED DOSE TOXICITY
3 MONTHS DIETARY

TEST SUBSTANCE

p-tert-Octylphenol

CAS No. 140-66-9



IUCLID Identification Number: 140-66-9

Method/guideline followed: Information not available in database
GLP: (N)
Year study performed: 1961

Species/strain: Rat Albino.

No. of rats per sex per dose: 15/sex/dose.

Route of administration: Oral feed.

Sex: Males and females.

Exposure Period: 3 months.

Dose/Concentration: 5% in diet.

Frequency of treatment: Daily.

Control group: Yes.

Post exposure observation period: None.

Test Conditions: Fifteen young male and young female albino rats were placed on the following dietary concentrations of the test substance: 0 and 5%. Finely ground Purina Dog Chow Kibbled Meal served as the basic diet and into this was incorporated a 35% aqueous solution of the test substance in amount calculated to achieve a 5% concentration of the active ingredient. An equivalent amount of water was added to the diet of the control rats. The animals were individually caged and were weighed once a week. Food consumption data were collected over a 3-day period during the thirteenth week. Urine collected during the last week from 5 rats of each sex at each dietary level was tested semiquantitiatively for glucose (Morris Anthrone method) and protein (Pro-Teen, sulfosalicyclic acid and Shevky & Stafford methods). Haematologic determinations on 5 rats of each sex at each dietary level were made at the end of the test period.

Organ to body weight ratios for liver, kidney, spleen, heart and testes were determined at sacrifice of the 3-month survivors. Tissues taken for histopathologic study were: heart, lung, liver, kidney, spleen, gastroenteric, bladder, bone marrow, muscle, skin, brain, thyroid, adrenal and pancreas.

RESULTS

No effects of treatment were apparent and there were no deviations in food consumption. Urinary concentrations of glucose and protein were comparable in treated and control animals. There were no haematologic related effects to treatment. There were no statistically related differences for organ to body weight between control and treated animals. There were no lesions apparent.

CONCLUSIONS

Feeding of 5% of the test substance in the diet of rats for a period of 3 months had no effect on growth, survival, food consumption, urinary excretion of glucose and protein, haematologic values, or organ to body weight ratios, and produced no pathologic lesions.

DATA QUALITY

Not a GLP study.

Information taken from the IUCLID database and report.

REFERENCES

IUCLID database.

Rohm and Haas, 1961 EPA/OPTS Public file 40-6162030, microfiche no.: 0527757.

OTHER

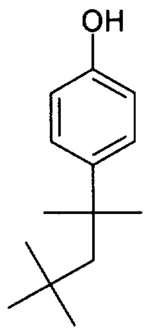
Source: Huels AG Marl.

17.1 TOXICITY TO REPRODUCTION

TEST SUBSTANCE

p-tert-Octylphenol

CAS No. 140-66-9



IUCLID Identification Number: 140-66-9

METHOD

Guideline followed: OPPTS Draft Testing Guidelines (870.3800; 1996 with additions)
Type: Two generation Reproduction study (one litter per generation)
GLP: unconfirmed
Year study performed: unknown, but after 1996

Species: Rat/CD® (Sprague-Dawley)

Route of administration: Oral diet

Doses levels: 0, 0.2, 20, 200, and 2000 ppm (dose range selected to evaluate potential toxicity at conventional high dosage, and also to address the possibility of low-dose oestrogenic effects)

Number of animals and sex: 30 male and 30 female per group.

Age of animals before initiation of dosing: not known

Frequency of treatment: Continuous from study day 1 until necropsy/termination

Premating exposure for males and females: 10 weeks

Study design:

F0 and F1 Animals were randomly mated within treatment groups for a two-week mating period to produce the next generation. Males were necropsied after the delivery period. Litters were culled to 10 pups on postnatal day (pnd) 4 and weaned on pnd 21.

At weaning, up to 3 weanlings/sex/litter were necropsied, and 30/sex/dose were selected as parents of the next generation.

For F1 weanlings, acquisition of vaginal patency in females and preputial separation in males was assessed, and vaginal cytology for estrous cyclicity was evaluated for three weeks prior to mating.

On the day of birth, anogenital distance was measured for F2 offspring. F2 weanling females were retained through acquisition of vaginal patency, at which time they were terminated without further evaluation. F2 males were retained through acquisition of preputial separation, until age 111±5 days, when they were subjected to necropsy.

Parental females were necropsied after weaning of their litters, with organ weights and histopathology including enumeration of ovarian follicles.

Parental males were necropsied after the littering period, with reproductive organ weights, epididymal sperm count, sperm motility and morphology, testicular homogenization-resistant spermatid count, and histopathology. In addition, dorsal prostate weight and epididymal sperm and testicular spermatid measurements were recorded for the F2 males.

Statistical methods:

Not known

RESULTS

F0 results

Adult systemic toxicity was evident for F0 parental animals at 2000 ppm, expressed as consistent and persistent reductions in body weights and weight gains during the premating period.

Feed consumption in g/day and g/kg/day and food efficiency was variable.

There were no treatment or dose-related clinical signs of toxicity in either sex.

Body weights during gestation were unaffected and were reduced during lactation in females at 2000 ppm.

There were no effects of treatment in F0 females on mating, fertility, pregnancy, or gestational indices.

There were also no effects of treatment in males on mating or fertility indices.

Estrous cycle length and stage of estrous at necropsy were equivalent across all F0 females.

Paired ovarian follicle counts were equivalent between high dose and control groups for F0 females.

Gestational length in days was equivalent across all groups for females.

Necropsy: In parental male rats absolute organ weights were almost uniformly unaffected for the liver, kidneys, adrenal glands, spleen and brain. Relative organ weights exhibited only occasional increases, almost exclusively at 2000 ppm, most likely due to the reduced body weights at this dietary concentration. There were no treatment-related gross or microscopic findings on these organs.

Absolute and relative uterine weights were significantly reduced at 2000 ppm; ovarian weights were unaffected.

There were no effects of treatment on any adult male reproductive organs, including no effects on absolute or relative weights of testes, epididymides, prostate, dorsal prostate, seminal vesicles with coagulating glands, and no gross or microscopic effects of treatment on these organs. There were also no effects of treatment on epididymal sperm concentration, percent motile or progressively motile sperm, testicular homogenisation-resistant spermatid head counts, daily sperm production, efficiency of daily sperm production, or percent abnormal sperm for males.

F1 results

Adult systemic toxicity was evident for F1 parental animals at 2000 ppm, expressed as consistent and persistent reductions in body weights and weight gains during the prebreed.

Feed consumption in g/day and g/kg/day and food efficiency was variable.

There were no treatment or dose-related clinical signs of toxicity in either sex.

Body weights during gestation were unaffected and were reduced during lactation in females at 2000 ppm.

There were no effects of treatment in F1 females on mating, fertility, pregnancy, or gestational indices.

There were also no effects of treatment in males on mating or fertility indices.

Estrous cycle length and stage of estrous at necropsy were equivalent across all F1 females.

Paired ovarian follicle counts were equivalent between high dose and control groups for F1 females.

Gestational length in days was slightly but statistically significantly prolonged at 0.2 ppm (by 0.3 days). Gestation length was unaffected at 20, 200 or 2000 ppm for F1 females.

For F1 offspring, there were no effects of treatment on stillbirth or live birth indices, for number of live pups per litter on pnd 0, sex ratio (% males) throughout lactation, lactational survival index (pnd 4-21), or 4-, 7-, 14- or 21-day survival indices.

Pup body weights per litter were significantly reduced at 2000 ppm on PND 14 and 21.

Reduced pup weights were observed only during the latter portion of the lactational period when the pups generally began to self-feed and therefore were likely to be directly exposed to the test chemical in the diet (CD® rat pups begin to self-feed late in the 2nd week of life).

Acquisition of vaginal patency and preputial separation in offspring was significantly delayed (by less than two days) at 2000 ppm, most likely related to the lower body weights of these pups at this dose.

These minimal effects on reproductive development in the offspring required (by guideline) measurement of anogenital distance in F2 offspring at birth (pnd 0)

Necropsy:

In parental male rats absolute organ weights were almost uniformly unaffected for the liver, kidneys, adrenal glands, spleen and brain. Relative organ weights exhibited only occasional increases, almost exclusively at 2000 ppm, most likely due to the reduced body weights at this dietary concentration. There were no treatment-related gross or microscopic findings on these organs. Absolute and relative weights of F1 female reproductive organs (ovaries and uterus) were unaffected by treatment.

There were no effects of treatment on any adult male reproductive organs, including no effects on absolute or relative weights of testes, epididymides, prostate, dorsal prostate, seminal vesicles with coagulating glands, and no gross or microscopic effects of treatment on these organs. There were also no effects of treatment on epididymal sperm concentration, percent motile or progressively motile sperm, testicular homogenisation-resistant spermatid head counts, daily sperm production, efficiency of daily sperm production, or percent abnormal sperm for males.

F2 results

Adult systemic toxicity was evident for F2 retained animals at 2000 ppm, expressed as consistent and persistent reductions in body weights and weight gains during the postwean exposure period.

Feed consumption in g/day and g/kg/day and food efficiency was variable.

There were no treatment or dose-related clinical signs of toxicity in either sex.

For F2 offspring, there were no effects of treatment on stillbirth or live birth indices, for number of live pups per litter on pnd 0, sex ratio (% males) throughout lactation, lactational survival index (pnd 4-21), or 4-, 7-, 14- or 21-day survival indices.

Pup body weights per litter were significantly reduced at 2000 ppm on PND 14 and 21.

Reduced pup weights were observed only during the latter portion of the lactational period when the pups generally began to self-feed and therefore were likely to be directly exposed to the test chemical in the diet.

Acquisition of vaginal patency and preputial separation in offspring was significantly delayed (by less than two days) at 2000 ppm, most likely related to the lower body weights of these pups at this dose.

F2 male pups exhibited no effect of treatment on anogenital distance. F2 female pups exhibited statistically significantly longer mean anogenital distances at 0.2 ppm (0.79 mm), 20 ppm (0.81 mm), 200 ppm (0.85 mm), and 2000 ppm (0.79 mm) relative to the control group value (0.76 mm); these changes were not considered biologically significant.

Necropsy:

In retained F2 male rats absolute organ weights were almost uniformly unaffected for the liver, kidneys, adrenal glands, spleen and brain. Relative organ weights exhibited only occasional increases, almost exclusively at 2000 ppm, most likely due to the reduced body weights at this dietary concentration. There were no treatment-related gross or microscopic findings on these organs.

There were no effects of treatment on any adult male reproductive organs, including no effects on absolute or relative weights of testes, epididymides, prostate, dorsal prostate, seminal vesicles with coagulating glands, and no gross or microscopic effects of treatment on these organs. There were also no effects of treatment on epididymal sperm concentration, percent motile or progressively motile sperm, testicular homogenisation-resistant spermatid head counts, daily sperm production, efficiency of daily sperm production, or percent abnormal sperm for F2 retained adult males.

CONCLUSION

NOAELs for systemic and postnatal toxicity were 200 ppm and at or above 2000 ppm for reproductive toxicity.

Dietary exposure to octylphenol for two generations, one litter per generation, at 0, 0.2, 20, 200 and 2000 ppm, resulted in:

Decreased body weights and weight gains at 2000 ppm

Offspring toxicity (reduced body weight during lactation) at 2000 ppm

Delayed vaginal opening and preputial separation at 2000 ppm considered related to body weight decreases

No effects on reproductive parameters

No effects on testes weights or morphology

No effects on epididymal sperm counts, motility or morphology

No effects on daily sperm production or efficiency of daily sperm production

No estrogen-like effects on males or females

No effects on prostate or dorsal prostate weights or histopathology.

DATA QUALITY

Study performed using OPPTS Draft Testing Guidelines (870.3800;1996 with additions)

REFERENCES

Two-Generation Reproductive Toxicity Evaluation of Para-tert Octylphenol Administered in the Feed to CD® (Sprague-Dawley) Rats (Abstract)

Sponsor: Union Carbide Corporation, Health, Safety & Environmental, 39 Old Ridgebury Road, Danbury, CT 06817-0001, USA.

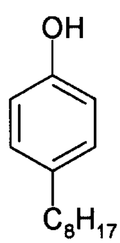
PHYSICAL/CHEMICAL ELEMENTS

1.1 MELTING POINT

TEST SUBSTANCE

p-Octylphenol

CAS No. 1806-26-4



METHOD

Method/guideline followed: calculation.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Melting point: 82.77°C (weighted value).

CONCLUSIONS

The test substance has a calculated melting point of 82.77°C.

DATA QUALITY

Calculation method used.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. MPBPWIN v1.30.

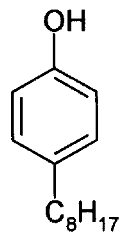
OTHER

2.1 BOILING POINT

TEST SUBSTANCE

p-Octylphenol

CAS No. 1806-26-4



METHOD

Method/guideline followed: Schenectady International Inc. internal procedure .

GLP (Y/N): No

Year study performed: 1992.

RESULTS

Boiling point: 296°C at 760 mm Hg without decomposition.

CONCLUSIONS

The test substance has a boiling point of 296°C at 760 mm Hg .

DATA QUALITY

Not a GLP study.

Information taken from a technical datasheet.

Purity of the test substance: 85.0% octylphenol min. and 15.0% nonylphenol max.

REFERENCES

Schenectady International Inc. Technical Datasheet (7/92).

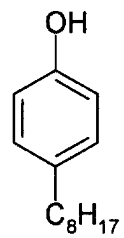
OTHER

3.1 VAPOUR PRESSURE

TEST SUBSTANCE

p-Octylphenol

CAS No. 1806-26-4



METHOD

Method/guideline followed: calculation.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Vapour pressure: 0.000098 mm Hg @ 25°C (0.013 Pa).

CONCLUSIONS

The test substance has a vapour pressure of 0.000098 mm Hg @ 25°C.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. MPBPWIN v1.30.

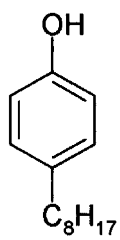
OTHER

4.1 PARTITION COEFFICIENT

TEST SUBSTANCE

p-Octylphenol

CAS No. 1806-26-4



METHOD

Method/guideline followed: calculation.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Log Kow: 5.50

CONCLUSIONS

The test substance has a log Kow of 5.50.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. KOWWIN v1.63.

OTHER

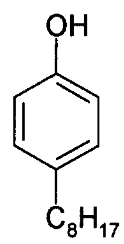
Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 (Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994).

5.1 WATER SOLUBILITY

TEST SUBSTANCE

p-Octylphenol

CAS No. 1806-26-4



METHOD

Method/guideline followed: calculation.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Water solubility: 3.114 mg/l at 25°C.

CONCLUSIONS

The solubility of the test substance in water is 3.114 mg/l at 25°C.

DATA QUALITY

Calculation method used.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. WSKOW v1.33.

OTHER

Log Kow value used: 5.50.

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 (Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994).

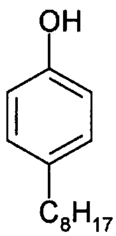
ENVIRONMENTAL FATE AND PATHWAY ELEMENTS

6.1 PHOTODEGRADATION

TEST SUBSTANCE

p-Octylphenol

CAS No. 1806-26-4



METHOD

Method/guideline followed: calculation using the programme AOPWIN v1.88.

Test type: calculation of the rate constant for the atmospheric reaction between photochemically produced hydroxyl radicals and the test substance in the vapour phase.

GLP (Y/N): no.

Year study performed: calculation made for this HPV submission.

RESULTS

Sensitizer: hydroxyl radical.

Overall hydroxyl rate constant: 50.3×10^{-12} cm^3/molecule-sec.

Half-life: 2.55 hours.

CONCLUSIONS

The programme estimates that in a typical atmosphere 50% of the test substance will undergo reaction in 2.55 hours.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. AOPWIN v 1.88.

OTHER

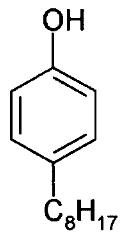
No experimental data was found on direct aqueous photolysis of the test substance. However, *p*-cresol, a related substance, in aqueous solution is reported as having a half-life of 35 days in sunlight (Smith, J.H. et al, "Environmental Pathways of Selected Chemicals in Freshwater Systems: Part II. Laboratory Studies," EPA-600/7-78-074, May 1978. Cited in Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, page 8-38.

7.1 STABILITY IN WATER

TEST SUBSTANCE

p-Octylphenol

CAS No. 1806-26-4



COMMENT

No abiotic hydrolysis studies were located.

The category phenols do not possess any functional groups that are regarded as being susceptible to hydrolysis under environmental conditions (Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, pages 7-4 and 7-5).

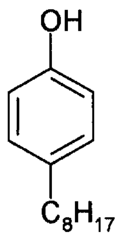
The software prediction programme HYDROWIN v1.66 cannot estimate hydrolysis rate constants for phenols.

8.1 TRANSPORT BETWEEN ENVIRONMENTAL COMPARTMENTS (FUGACITY)

TEST SUBSTANCE

p-Octylphenol

CAS No. 1806-26-4



METHOD

Test type: Calculation of partitioning between environmental compartments.

Year study performed: Model run for this HPV submission.

Model: Level 1 Fugacity-Based Environmental Partitioning Model v2.11.

Input values

Chemical specific

Molecular mass:	206
Data temperature (°C):	25
Water solubility (mg/l):	3.114
Vapour pressure (Pa):	0.013
Log Kow:	5.50
Melting point (°C):	83

Environmental conditions: defaults used.

RESULTS

Environmental compartment	Percentage of test substance
Air	0.060
Soil	97.4
Water	0.35
suspended sediment	0.068
fish	0.0055
Sediment	2.16

DATA QUALITY

The Mackay Level I Fugacity Model estimates the equilibrium distribution of a fixed quantity of a non-reacting chemical in a closed environment at equilibrium; with no degradation reactions and no flow or intermedia transport processes. The chemical is assumed to distribute instantaneously to an equilibrium concentration and therefore the medium receiving the emission is unimportant. This model is an aid to understanding the physical chemistry properties that are of greatest importance in determining the environmental distribution of substances; it is not a tool to predict actual or likely concentrations in a real environment.

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 and therefore their physical chemistry properties are unlikely to be affected by the pH values normally found in the environment.

REFERENCES

This software program is available with the publication: Mackay, D., Multimedia environmental models: the fugacity approach, Lewis Publishers Inc., Chelsea, MI, 1991.

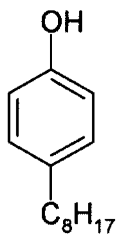
OTHER

9.1 BIODEGRADATION

TEST SUBSTANCE

p-Octylphenol

CAS No. 1806-26-4



METHOD

Method/guideline followed: calculation using the programme BIOWIN v3.65.

Test type: calculation of the probability for rapid aerobic biodegradation of the test substance in the presence of mixed populations of environmental microorganisms.

GLP (Y/N): no.

Year study performed: calculation made for this HPV submission.

RESULTS

Primary biodegradation: in days.

Ultimate biodegradation: in weeks.

CONCLUSIONS

The programme predicts that under the stated conditions the test substance will biodegrade rapidly.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. BIOWIN v 3.65.

OTHER

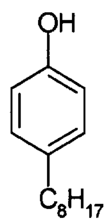
ECOTOXICITY ELEMENTS

10.1 ACUTE TOXICITY TO FISH

TEST SUBSTANCE

p-Octylphenol

CAS No. 1806-26-4



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Fish

Exposure period: 96 hours, 30 days and 90 days

RESULTS

LC50 (96hr) 0.21 mg/l

ChV(30 day) 0.030 mg/l

ChV (90 day) 0.007 mg/l

Remark: log Kow used 5.50 (calculated value)

CONCLUSIONS

Estimated LC50 (96hr) for the test substance was found to be 0.21 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v.0.99e

OTHER

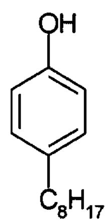
Calculation performed for this HPV submission.

11.1 TOXICITY TO AQUATIC PLANTS (E.G., ALGAE)

TEST SUBSTANCE

p-Octylphenol

CAS No. 1806-26-4



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
2000

Species: Green algae

Exposure period: 96 hours

RESULTS

EC50 (96hr) 0.082 mg/l

ChV (96hr) 0.062 mg/l

Remark: log Kow used 5.50 (calculated value)

CONCLUSIONS

Estimated EC50 (96hr) for the test substance was found to be 0.082 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v.0.99e

OTHER

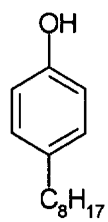
Calculation performed for this HPV submission.

12.1 ACUTE TOXICITY TO AQUATIC INVERTEBRATES (E.G., DAPHNIA)

TEST SUBSTANCE

p-Octylphenol

CAS No. 1806-26-4



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Daphnid

Exposure period: 48 hours, 21 days

RESULTS

LC50 (48hr) 0.41 mg/l

ChV (21day) 0.023 mg/l

Remark: log Kow used 5.50 (calculated value)

CONCLUSIONS

Estimated LC50 (48hr) for the test substance was found to be 0.41 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v. 0.99e

OTHER

Calculation performed for this HPV submission.

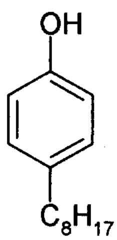
HEALTH ELEMENTS

13.1 ACUTE TOXICITY
ORAL

TEST SUBSTANCE

p-Octylphenol

CAS No. 1806-26-4



METHOD

EPA 40 CFR 163.81-1 Defined Oral LD_{50}
GLP: (N)
Year study performed: 1985

Species: Albino rats

Sex: Males and Females

No of animals per sex per dose: 5 males and 5 females

Vehicle: Corn oil

Route of administration: Oral, gavage

Remarks: Following a range finding study, 5 groups of ten fasted animals were given a single oral dose of the test material. Dose range used was 0.25-2.0 g/kg. After dosing the animals were observed for 14 days.

RESULTS

LD50 Total 1.2 g/kg, Male 1.4 g/kg, Female 1.1 g/kg

95% confidence limits: Upper 1.78 g/kg, Lower 0.9 g/kg

Dosage 0.25 g/kg and 0.5 g/kg: no signs of toxicity.

Dosage 1.0, 1.5 and 2.0 g/kg: increasing signs of toxicity with dosage with death of all animals at 2.0 g/kg.

Clinical signs included diarrhoea, lethargy, inability to move, bloody nasal discharge chromodacryorrhoea and loss of appetite.

CONCLUSIONS

LD50: 1.2 g/kg

EPA Category III

DATA QUALITY

No evidence of GLP. Conducted to EPA guidelines.

REFERENCES

Product Safety Labs, 725 Cranbury Road, East Brunswick, New Jersey 08816, USA study report no. T-5049

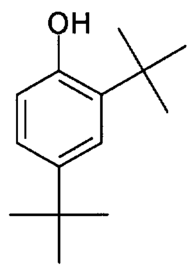
PHYSICAL/CHEMICAL ELEMENTS

1.1 MELTING POINT

TEST SUBSTANCE

2,4-Di-*tert* butylphenol

CAS No. 96-76-4



METHOD

Method/guideline followed: ASTM D 1015.

GLP (Y/N): no.

Year study performed: 1994.

RESULTS

Melting point: 56.5°C.

CONCLUSIONS

The test substance has a melting point of 56.5°C.

DATA QUALITY

Not a GLP study.

Information taken from IUCLID database.

Purity of the test substance / decomposition: information not available in database.

REFERENCES

Huels AG: Produktinformation "2, 4-Di-*tert*-butylphenol", Art. No. 001156, 01-Aug-1994 as cited in IUCLID database.

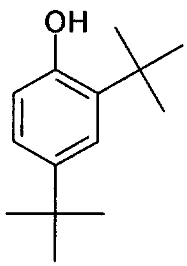
OTHER

2.1 BOILING POINT

TEST SUBSTANCE

2,4-Di-*tert* butylphenol

CAS No. 96-76-4



METHOD

Method/guideline followed: information not available in database.

GLP (Y/N): no.

Year study performed: 1995.

RESULTS

Boiling point: 264°C at 101300 Pa (760 mm Hg).

CONCLUSIONS

The test substance has a boiling point of 264°C at 101300 Pa.

DATA QUALITY

Not a GLP study.

Information taken from IUCLID database.

Purity of the test substance / decomposition: information not available in database.

REFERENCES

Huels AG: Sicherheitsdatenblatt "2, 4-Di-tert-butylphenol", Version 04, 13.01.95 as cited in IUCLID database.

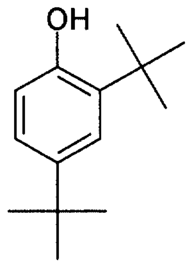
OTHER

3.1 VAPOUR PRESSURE

TEST SUBSTANCE

2,4-Di-*tert* butylphenol

CAS No. 96-76-4



METHOD

Method/guideline followed: information not available in database.

GLP (Y/N): no.

Year study performed: 1994.

RESULTS

Vapour pressure: ca. 1.0 Pa @ 20°C.

CONCLUSIONS

The test substance has a vapour pressure of ca. 1.0 Pa @ 20°C.

DATA QUALITY

Not a GLP study.

Information taken from IUCLID database.

Purity of the test substance / decomposition: information not available in database.

REFERENCES

Huels AG: Produktinformation "2, 4-Di-tert-butylphenol", Art. No. 001156, 01-AUG-1994 as cited in IUCLID database.

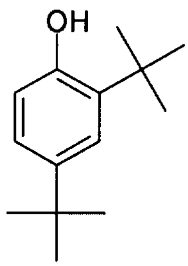
OTHER

4.1 PARTITION COEFFICIENT

TEST SUBSTANCE

2,4-Di-*tert* butylphenol

CAS No. 96-76-4



METHOD

Method/guideline followed: calculation.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Log Kow: 5.33.

CONCLUSIONS

The test substance has a log Kow of 5.33.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. KOWWIN v1.63.

OTHER

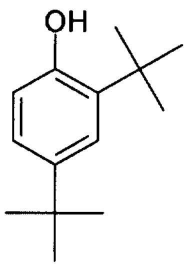
Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 (Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994).

5.1 WATER SOLUBILITY

TEST SUBSTANCE

2,4-Di-*tert* butylphenol

CAS No. 96-76-4



METHOD

Method/guideline followed: information not available in database.

GLP (Y/N): no.

Year study performed: 1994.

RESULTS

Water solubility: 12 mg/l at 20°C.

CONCLUSIONS

The solubility of the test substance in water is 12 mg/l at 20°C.

DATA QUALITY

Not a GLP study.

Information taken from IUCLID database.

Purity of the test substance: information not available in database.

REFERENCES

Huels AG: Produktinformation "2, 4-Di-tert-butylphenol", Art. No. 001156, 01-AUG-1994 as cited in IUCLID database.

OTHER

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 (Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994).

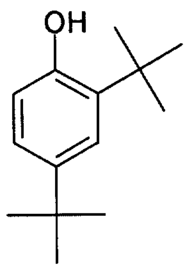
ENVIRONMENTAL FATE AND PATHWAY ELEMENTS

6.1 PHOTODEGRADATION

TEST SUBSTANCE

2,4-Di-*tert* butylphenol

CAS No. 96-76-4



METHOD

Method/guideline followed: calculation using the programme AOPWIN v1.88.

Test type: calculation of the rate constant for the atmospheric reaction between photochemically produced hydroxyl radicals and the test substance in the vapour phase.

GLP (Y/N): no.

Year study performed: calculation made for this HPV submission.

RESULTS

Sensitizer: hydroxyl radical.

Overall hydroxyl rate constant: 49.1×10^{-12} cm^3/molecule-sec.

Half-life: 2.61 hours.

CONCLUSIONS

The programme estimates that in a typical atmosphere 50% of the test substance will undergo reaction in 2.61 hours.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. AOPWIN v 1.88.

OTHER

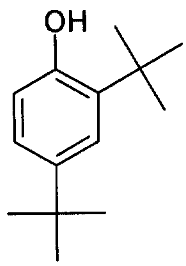
No experimental data was found on direct aqueous photolysis of the test substance. However, *p*-cresol, a related substance, in aqueous solution is reported as having a half-life of 35 days in sunlight (Smith, J.H. et al, "Environmental Pathways of Selected Chemicals in Freshwater Systems: Part II. Laboratory Studies," EPA-600/7-78-074, May 1978. Cited in Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, page 8-38.

7.1 STABILITY IN WATER

TEST SUBSTANCE

2,4-Di-*tert* butylphenol

CAS No. 96-76-4



COMMENT

No abiotic hydrolysis studies were located.

The category phenols do not possess any functional groups that are regarded as being susceptible to hydrolysis under environmental conditions (Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, pages 7-4 and 7-5).

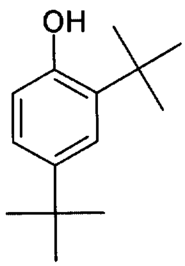
The software prediction programme HYDROWIN v1.66 cannot estimate hydrolysis rate constants for phenols.

8.1 TRANSPORT BETWEEN ENVIRONMENTAL COMPARTMENTS (FUGACITY)

TEST SUBSTANCE

2,4-Di-*tert* butylphenol

CAS No. 96-76-4



METHOD

Test type: Calculation of partitioning between environmental compartments.

Year study performed: Model run for this HPV submission.

Model: Level 1 Fugacity-Based Environmental Partitioning Model v2.11.

Input values

Chemical specific

Molecular mass:	206
Data temperature (°C):	25
Water solubility (mg/l):	12
Vapour pressure (Pa):	1.0
Log Kow:	5.33
Melting point (°C):	56.5

Environmental conditions: defaults used.

RESULTS

Environmental compartment	Percentage of test substance
Air	1.75
Soil	95.6
Water	0.50
suspended sediment	0.066
fish	0.0054
Sediment	2.12

DATA QUALITY

The Mackay Level I Fugacity Model estimates the equilibrium distribution of a fixed quantity of a non-reacting chemical in a closed environment at equilibrium; with no degradation reactions and no flow or intermedia transport processes. The chemical is assumed to distribute instantaneously to an equilibrium concentration and therefore the medium receiving the emission is unimportant. This model is an aid to understanding the physical chemistry properties that are of greatest importance in determining the environmental distribution of substances; it is not a tool to predict actual or likely concentrations in a real environment.

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 and therefore their physical chemistry properties are unlikely to be affected by the pH values normally found in the environment.

REFERENCES

This software program is available with the publication: Mackay, D., Multimedia environmental models: the fugacity approach, Lewis Publishers Inc., Chelsea, MI, 1991.

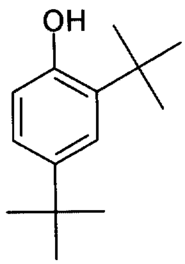
OTHER

9.1 BIODEGRADATION

TEST SUBSTANCE

2,4-Di-*tert* butylphenol

CAS No. 96-76-4



METHOD

Method/guideline followed: calculation using the programme BIOWIN v3.65.

Test type: calculation of the probability for rapid aerobic biodegradation of the test substance in the presence of mixed populations of environmental microorganisms.

GLP (Y/N): no.

Year study performed: calculation made for this HPV submission.

RESULTS & CONCLUSIONS

The program predicts:

Primary biodegradation in days/weeks

Ultimate biodegradation in weeks/months.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. BIOWIN v 3.65.

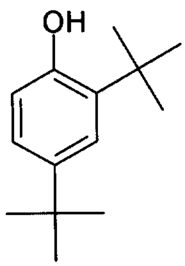
OTHER

9.2 BIODEGRADATION

TEST SUBSTANCE

2,4-Di-*tert* butylphenol

CAS No. 96-76-4



METHOD

Method/guideline followed: ISO draft "BOD test for insoluble substances".

Test type: aerobic.

GLP (Y/N): no.

Year study performed: 1990.

Contact time: 28 days.

Innoculum: non-adapted activated sludge.

Concentration: 34.5 mg/l (related to test substance).

RESULTS

Percentage degradation: 2% after 28 days.

CONCLUSIONS

The test substance was not readily biodegradable under the test conditions.

DATA QUALITY

Not a GLP study.

Test concentration was higher than water solubility of test substance.

REFERENCES

Huels AG, report No. BO 90/5, 1990 (unpublished) as cited in IUCLID database.

OTHER

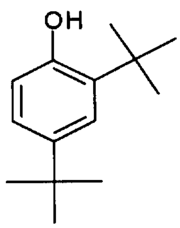
ECOTOXICITY ELEMENTS

10.1 ACUTE TOXICITY TO FISH

TEST SUBSTANCE

2, 4- Di- *tert*-butylphenol

CAS No. 96-76-4



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Fish

Exposure period: 96hours, 30days, 90 days

RESULTS

LC50 (96hr) 0.27 mg/l

ChV(30day) 0.038 mg/l

ChV(90day) 0.008 mg/l

Remarks: log Kow used 5.33 (calculated value)

CONCLUSIONS

Estimated LC50 (96hr) value for the test substance was found to be 0.27 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v 0.99e

OTHER

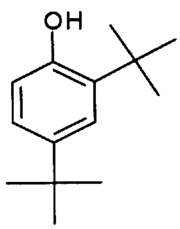
Calculation performed for this HPV submission.

11.1 ACUTE TOXICITY TO ALGAE

TEST SUBSTANCE

2, 4- Di- *tert-butylphenol*

CAS No. 96-76-4



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Green algae

Exposure period: 96 hours

RESULTS

EC50 (96hr) 0.12 mg/l

ChV (96hr) 0.079 mg/l

Remarks: log Kow used 5.33 (calculated value)

CONCLUSIONS

Estimated EC50 (96hr) value for the test substance was found to be 0.12 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v 0.99e

OTHER

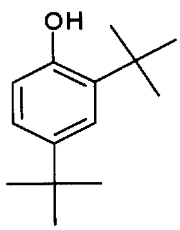
Calculation performed for this HPV submission.

12.1 ACUTE TOXICITY TO AQUATIC INVERTEBRATES (E.G., DAPHNIA)

TEST SUBSTANCE

2, 4- Di- *tert-butylphenol*

CAS No. 96-76-4



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Daphnid

Exposure period: 48hours, 21 days

RESULTS

LC50 (48hr) 0.48 mg/l

ChV (21day) 0.029 mg/l

Remarks: log Kow used 5.33 (calculated value)

CONCLUSIONS

Estimated LC50 (48hr) value for the test substance was found to be 0.48 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v 0.99e

OTHER

Calculation performed for this HPV submission.

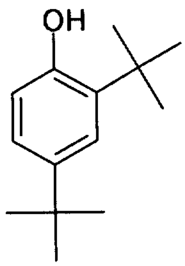
HEALTH ELEMENTS

13.1 ACUTE TOXICITY
ORAL

TEST SUBSTANCE

2,4-Di-*tert* butylphenol

CAS No. 96-76-4



No information is provided concerning the degree of purity of the material used in the test.

METHOD

Acute oral toxicity to rat EPA CFR 163. 81-1, PSL –SOP No. 006
GLP: No data available
Year study performed: 1985

Species: Albino rats

Sex: Males and females

No of animals per sex per dose: 30 males and 30 females

Vehicle: 50% suspension in corn oil

Route of administration: Oral, gavage

Remarks: After dosing the animals, their feed was returned and they were observed daily of mortality and other signs of gross toxicity for 14 days. Gross necropsies were performed on all mortalities and on all survivors at terminal sacrifice. At the end of the test period individual final body weights were recorded. The defined oral LD50 was calculated as by Litchfield – Wolcoxon Method of Probit Analysis (J. Pharmacology and Experimental Therapeutics 96: 99-115, 1949).

RESULTS

Acute oral LD50:

Total: 1.5 g/kg (95% confidence limits 1.2 – 1.9 g/kg)

Male: 2.1 g/kg (Estimated graphically)

Female: 1.3 g/kg (Estimated graphically)

30% mortality occurred in the test group dosed at 1.0 g/kg. Clinical signs included loss of appetite, hunched posture, inability to move and chromodacryorrhoea. Deaths occurred on days 4 and 5. The survivors recovered and returned to normal on Day 4. Prior to recovery, these rats were lethargic, and one had a bloody nasal discharge. All surviving animals gained weight and appeared healthy at terminal sacrifice

50% mortality (2 males, 3 females) occurred in the test group dosed at 1.5 g/kg within 6 days post dose. Preceding death symptoms included diarrhoea, loss of appetite, bloody ocular and nasal discharges and inability to move. Among the survivors, all had transient diarrhoea for several hours on the day of dosing. Other signs of toxicity prior to recovery included lethargy, loss of appetite in one case, accelerated breathing and hindered mobility. By Day 7 the surviving animals had regained all functions and gained weight. They continued to gain weight and remained active for the balance of the observation period.

40% mortality occurred in the test group dosed at 2.0 g/kg (2 males, 2 females). The two males and one of the females died on Day 4. The other female died on Day 6. Prior to death two of the animals were cyanotic and along with the rest showed variety of symptoms including loss of appetite, diarrhoea, chromodacryorrhoea, hunched posture, bloody nasal discharge, immobility and lethargy. By Day 7 all surviving animals appeared to recover after showing symptoms of lethargy, loss of appetite and no overt signs of intoxication. At terminal sacrifice, all survivors were active and all gained weight.

90% mortality (5 males and 4 females) occurred in the test group dosed at 2.5 g/kg. One rat died on Day 2; seven on Day 3; and one on Day 5. Preceding death animals showed toxic symptoms and signs that included bloody discharge from nasal and ocular orifices, diarrhoea, inability to move and lethargy. Recovery was apparent by Day 8 and at terminal sacrifice the only surviving rat gained weight.

80% mortality was noted in the test animals dosed at 3.0 g/kg: one animal died on Day 2; 4 animals on Day 4; and 3 animals on Day 6. Signs and symptoms recorded before death included hematuria in two cases, cyanosis in four cases, diarrhoea in all cases, ataxia or unsteady gait in two cases, loss of appetite in all cases, bloody nasal and ocular discharges and lethargy. The surviving 20% also showed diarrhoea, loss of appetite, bloody discharges and lethargy. These two animals recovered and remained active following Day 9 of the test. One out of two animals had lost weight by Day 7 while the other remained at the same weight; both gained weight by terminal sacrifice.

CONCLUSIONS

LD50: 1.5 g/kg.

DATA QUALITY

Study conducted according to EPA guidelines. No data available on GLP.

REFERENCES

Report No.T-5051, Product Safety Labs, 725 Cranbury Road, East Brunswick, New Jersey 08816, USA.

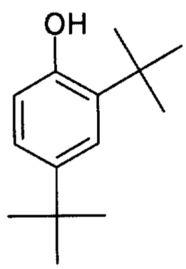
OTHER

13.2 ACUTE TOXICITY
DERMAL IRRITATION

TEST SUBSTANCE

2,4-Di-*tert* butylphenol

CAS No. 96-76-4



METHOD

OECD Guidelines No. 404
GLP: (Y)
Year study performed: 1991

Species: New Zealand rabbits, White.

Sex: Male, females.

No of animals per sex per dose: One male, two females.

Vehicle: 0.5 g of the test substance.

Remarks: All the work was performed in compliance with the good laboratory practice; except that the concentration, homogeneity and stability of the test material preparations were not determined by analysis; and that this specific study may not have been subject to procedure inspection by the Quality Assurance Unit.

RESULTS

A single 4-hour, semi-occluded application of the test material to the intact skin of three rabbits produced well defined erythema and very slight to slight oedema. Other skin reactions noted were haemorrhage of the dermal capillaries, blanching, light brown discoloration of the epidermis, crust formation and hardened light brown-coloured scabs.

The test produced a primary irritation index 3.5 and was classified as a moderate irritant to rabbit skin according to the Draize classification scheme. No corrosive effects were noted.

CONCLUSIONS

The test material was also classified as irritant according to EEC labelling regulations. The symbol "Xi" and risk phrase R 38 "Irritating to skin" are therefore required.

DATA QUALITY

Study conducted to GLP and OECD guidelines.

REFERENCES

Project number: 47/1591, Safepharm Laboratories Limited, P.O Box 45, Derby, DE1 2BT,. U.K.

OTHER

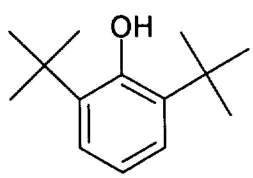
PHYSICAL/CHEMICAL ELEMENTS

1.1 MELTING POINT

TEST SUBSTANCE

2,6-Di-*tert* butylphenol

CAS No. 128-39-2



METHOD

Method/guideline followed: information not available in database.

GLP (Y/N): no.

Year study performed: not known.

RESULTS

Melting point: 36 - 37°C.

CONCLUSIONS

The test substance has a melting point range of 36 - 37°C.

DATA QUALITY

Not a GLP study.

Information taken from SIDS dossier.

Purity of the test substance / decomposition: information not available in database.

REFERENCES

Technical Bulletin FC:69:46:TB (Shell Chemicals)

Material Safety Datasheet, STIA, CH-4133 Pratteln, April 1989.

Both as cited in SIDS dossier for Phenol, 2,6-Bis(1,1-dimethyl).

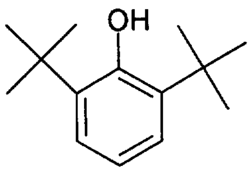
OTHER

2.1 BOILING POINT

TEST SUBSTANCE

2,6-Di-*tert* butylphenol

CAS No. 128-39-2



METHOD

Method/guideline followed: information not available in database.

GLP (Y/N): no.

Year study performed: not known.

RESULTS

Boiling point: 253°C at 10100 Pa (760 mm Hg).

CONCLUSIONS

The test substance has a boiling point of 253°C at 10100 Pa.

DATA QUALITY

Not a GLP study.

Information taken from SIDS dossier.

Purity of the test substance / decomposition: information not available in database.

REFERENCES

Technical Bulletin FC:69:46:TB (Shell Chemicals)

Material Safety Database, STIA, CH-4133 Pratteln, April 1989.

Both as cited in SIDS dossier for Phenol, 2,6-bis(1,1-dimethyl).

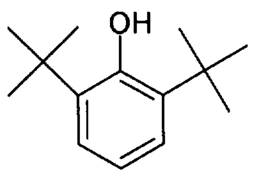
OTHER

3.1 VAPOUR PRESSURE

TEST SUBSTANCE

2,6-Di-*tert* butylphenol

CAS No. 128-39-2



METHOD

Method/guideline followed: gas saturation.

GLP (Y/N): yes.

Year study performed: 1990.

RESULTS

Vapour pressure: 0.0076 mm Hg at 20°C.

CONCLUSIONS

The test substance has a vapour pressure of ca. 0.0076 mm Hg at 20°C (1.01 Pa).

DATA QUALITY

GLP study.

Gas saturation is a recognised method described in EU, OECD and OPPTS guidelines.

REFERENCES

Vapour pressure of 2, 6-Di-t-Butylphenol. Unpublished report no. 56:89 from Ethyl Corporation, February 1990. As cited in SIDS dossier for Phenol, 2, 6-bis(1,1-dimethyl).

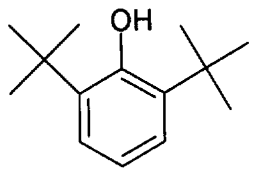
OTHER

4.1 PARTITION COEFFICIENT

TEST SUBSTANCE

2,6-Di-*tert* butylphenol

CAS No. 128-39-2



METHOD

Method/guideline followed: OECD 117, HPLC method.

GLP (Y/N): Yes.

Year study performed: 1992.

RESULTS

Log Kow: 4.5 at 24 - 26°C.

CONCLUSIONS

The test substance has a log Kow of 4.5.

DATA QUALITY

GLP study.

An acceptable test method has been used.

REFERENCES

Determination of the partition coefficient (n-octanol/water) of 2,6-bis(1,1-dimethylethyl)-phenol by HPLC. Unpublished RCC report no. 304424 from Sandoz Chemicals Ltd., March 1992 as cited in the SIDS dossier for Phenol, 2, 6-bis(1,1-dimethyl).

OTHER

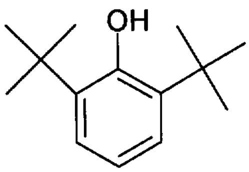
Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 (Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994).

5.1 WATER SOLUBILITY

TEST SUBSTANCE

2,6-Di-*tert* butylphenol

CAS No. 128-39-2



METHOD

Method/guideline followed: Generator Column Method in accordance with the Federal Register, Volume 50, Number 188, page 39265.

GLP (Y/N): yes.

Year study performed: 1988.

RESULTS

Water solubility: 4.11 mg/l at 25°C (pH 7), 3.99 mg/l at 25°C (pH 4), 4.69 mg/l at 25°C (pH 9).

CONCLUSIONS

The solubility of the test substance in water at pH 7 is 4.11 mg/l at 25°C and is unaffected by pH over the range pH 7 to 9.

DATA QUALITY

GLP study.

The generator column technique is an acceptable method.

REFERENCES

Springborn Life Sciences, Inc.: Determination of the water solubility of 2,6-Di-tert-butylphenol. Unpublished report number 88-07-2771, Study no. 10671-0887-6107-700, October 1988 as cited in the SIDS dossier for Phenol, 2, 6-bis(1,1-dimethyl).

OTHER

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 (Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994).

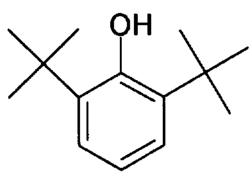
ENVIRONMENTAL FATE AND PATHWAY ELEMENTS

6.1 PHOTODEGRADATION

TEST SUBSTANCE

2,6-Di-*tert* butylphenol

CAS No. 128-39-2



METHOD

Method/guideline followed: calculation using the programme AOPWIN v1.88.

Test type: calculation of the rate constant for the atmospheric reaction between photochemically produced hydroxyl radicals and the test substance in the vapour phase.

GLP (Y/N): no.

Year study performed: calculation made for this HPV submission.

RESULTS

Sensitizer: hydroxyl radical.

Overall hydroxyl rate constant: 49.1×10^{-12} cm^3/molecule-sec.

Half-life: 2.61 hours.

CONCLUSIONS

The programme estimates that in a typical atmosphere 50% of the test substance will undergo reaction in 2.61 hours.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. AOPWIN v 1.88.

OTHER

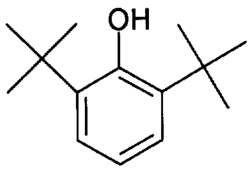
No experimental data was found on direct aqueous photolysis of the test substance. However, *p*-cresol, a related substance, in aqueous solution is reported as having a half-life of 35 days in sunlight (Smith, J.H. et al, "Environmental Pathways of Selected Chemicals in Freshwater Systems: Part II. Laboratory Studies," EPA-600/7-78-074, May 1978. Cited in Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, page 8-38.

6.2 PHOTODEGRADATION

TEST SUBSTANCE

2,6-Di-*tert* butylphenol

CAS No. 128-39-2



METHOD

Method/guideline followed: Determination of Indirect Photolysis, EPA TSCA Guideline 40 CFR 795-70.

Test type: indirect photolysis in simulated natural water.

GLP (Y/N): yes.

Year study performed: 1992.

Light source: natural light.

Light spectrum: that of natural light.

Light intensity: 67.5 to 476 footcandles.

Spectrum of substance (max lambda, max epsilon and epsilon 295): not stated.

Duration of test: the main test (phase III) lasted 29 hours (15 hours of daylight).

There were two main phases in the study. In the preliminary test (Phase II) approximate sunlight reaction rates were determined and an attempt made to differentiate between direct and indirect processes. From Phase III, the main study, net and direct photolysis rate constants were obtained.

Protocol deviations: all protocol deviations were minor and did not effect the results of the study except that HPLC-UV rather than HPLC-RAM was used for quantification of the test substance. This reduced the chance of detecting breakdown products.

RESULTS

Concentration of substance: 1.25 mg/l.

Temperature: *ca.* –0.2 to 26.5°C (samples were moved indoors each night to reduce the risk of freezing).

Indirect photolysis

Sensitizer (type): humic acid (in aqueous solution)
Concentration of sensitizer: 0.005% w/v.

Rate constants

Phase II

InDirect aqueous photolysis: 2.94 day^{-1}.

Direct aqueous photolysis: 2.16 day^{-1}.

Phase III

Net photolysis: 6.90 day^{-1}.

Direct aqueous photolysis: 15.17 day^{-1}.

Percentage degradation: photolytic half-life under environmental conditions 2.41 hours.

Breakdown products: no volatile breakdown products were observed.

CONCLUSIONS

2,6-Di-tertiary butylphenol is marginally susceptible to indirect photolysis in natural waters. The net photolytic half-life under environmental conditions was found to be 2.41 hours

DATA QUALITY

GLP study.

There was significant loss of the test substance from controls. This is believed to have been due to sorption onto glass.

REFERENCES

Springborn Laboratories Inc. 790 Main Street, Wareham, Massachusetts 02571, USA. Test report no. 92-1-4065, 5 August 1992.

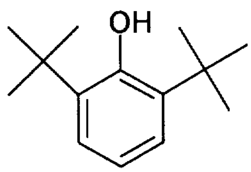
OTHER

7.1 STABILITY IN WATER

TEST SUBSTANCE

2,6-Di-*tert* butylphenol

CAS No. 128-39-2



COMMENT

No abiotic hydrolysis studies were located.

The category phenols do not possess any functional groups that are regarded as being susceptible to hydrolysis under environmental conditions (Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, pages 7-4 and 7-5).

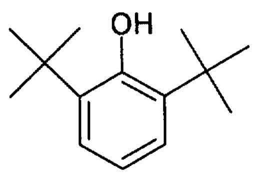
The software prediction programme HYDROWIN v1.66 cannot estimate hydrolysis rate constants for phenols.

8.1 TRANSPORT BETWEEN ENVIRONMENTAL COMPARTMENTS (FUGACITY)

TEST SUBSTANCE

2,6-Di-*tert* butylphenol

CAS No. 128-39-2



METHOD

Test type: Calculation of partitioning between environmental compartments.

Year study performed: Model run for this HPV submission.

Model: Level 1 Fugacity-Based Environmental Partitioning Model v2.11.

Input values

Chemical specific

Molecular mass:	206
Data temperature (°C):	25
Water solubility (mg/l):	4.11
Vapour pressure (Pa):	1.01
Log Kow:	4.5
Melting point (°C):	36.5

Environmental conditions: defaults used.

RESULTS

Environmental compartment	Percentage of test substance
Air	25.6
Soil	70.3
Water	2.51
suspended sediment	0.049
fish	0.0040
Sediment	1.56

DATA QUALITY

The Mackay Level I Fugacity Model estimates the equilibrium distribution of a fixed quantity of a non-reacting chemical in a closed environment at equilibrium; with no degradation reactions and no flow or intermedia transport processes. The chemical is assumed to distribute instantaneously to an equilibrium concentration and therefore the medium receiving the emission is unimportant. This model is an aid to understanding the physical chemistry properties that are of greatest importance in determining the environmental distribution of substances; it is not a tool to predict actual or likely concentrations in a real environment.

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 and therefore their physical chemistry properties are unlikely to be affected by the pH values normally found in the environment.

REFERENCES

This software program is available with the publication: Mackay, D., Multimedia environmental models: the fugacity approach, Lewis Publishers Inc., Chelsea, MI, 1991.

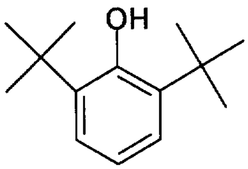
OTHER

9.1 BIODEGRADATION

TEST SUBSTANCE

2,6-Di-*tert* butylphenol

CAS No. 128-39-2



METHOD

Method/guideline followed: EEC, L 251 Vol. 27 (19.09.84) 84/449/EEC.C.5.

Test type: Ready biodegradability (aerobic) by the Modified Sturm Test.

GLP (Y/N): no.

Year study performed: 1990.

Contact time: 28 days.

Innoculum: Bacteria collected from activated sludge.

Concentrations: 10.5 and 20.2 mg/l of the test substance (these concentrations were in excess of the water solubility of the test substance; nonylphenol was therefore used as an emulsifier).

RESULTS

Percentage degradation

Lower concentration: 4% after 28 days.

Higher concentration: 1% after 28 days.

CONCLUSIONS

2,6-Di-tertiary butylphenol was not readily biodegradable under the conditions of this test.

DATA QUALITY

Not a GLP study.

REFERENCES

CIBA-GEIGY Ltd., Basle, Switzerland. Test report no. 894579, study completed 19.02.90. Title: Report on the test for ready biodegradability in the Modified Sturm Test of IRGANOX L 108.

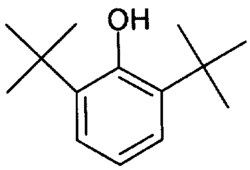
OTHER

9.2 BIODEGRADATION

TEST SUBSTANCE

2,6-Di-*tert* butylphenol

CAS No. 128-39-2



METHOD

Method/guideline followed: TSCA Test Guideline 796.3140.

Test type: Aquatic biodegradation under anaerobic conditions.

GLP (Y/N): yes.

Year study performed: 1991.

Contact time: 56 days.

Innoculum: Primary sludge from a wastewater treatment plant.

Concentration: 63 mg/l.

RESULTS

Percentage degradation: none.

The test concentration was considerably in excess of the water solubility of 2,6-di-tertiary butylphenol. There will therefore have been undissolved and sorbed material present in the test system. Some material may also have been present in the headspace of the test system.

CONCLUSIONS

2,6-Di-tertiary butylphenol was not biodegradable under the conditions of the study.

DATA QUALITY

GLP study.

REFERENCES

Springborn Laboratories Inc., 790 Main Street, Wareham, Massachusetts 02571, USA. Test Report no. 92-2-4105 (unpublished), (8/5/92).

OTHER

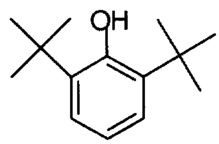
ECOTOXICITY ELEMENTS

10.1 ACUTE TOXICITY TO FISH

TEST SUBSTANCE

2,6-Di-*tert*-butylphenol

CAS No. 128-39-2



Purity of the test substance: information not available.

METHOD

Acute Toxicity to Fish Directive 84/449/EEC, Method C1
Test type: Static
GLP: Data not available
Year study performed: 1990

Species: Zebra-fish (*Brachydanio rerio*)

Analytical procedures: Data not available.

Remarks: Small parts of the test substance were floating at the surface of the tanks at 0 and 96-hour exposure.

Exposure period: 96 hours

Statistical methods: The LC50 values were calculated according to Berkson, Jasa 48 (1953), 569-599.

LC-values were graphically determined on gausso-logarithmic probability paper.

RESULTS

Nominal concentrations: 1.0, 1.8, 3.2, 5.8, 10 and 18 mg test substance /l

All results are expressed in mg/l and are base on nominal concentrations.

Calculated LC50 values with 95% confidence limits:

LC50 (24hr), 9.7 mg/l (7.8-12)

LC50 (48hr), 7.6 mg/l (6.5-8.9)

LC50 (72hr), 7.6 mg/l (6.5-8.9)

LC50 (96hr), 7.6 mg/l (6.5-8.9)

Graphically determined LC50 value:

LC50 (96hr), 7.6 mg/l

Observed LC50 values:

LC0 (96hr) in test, 5.8 mg/l

LC100 (96hr) in test, 10 mg/l

Controls: Mortalities in blank: 0%

CONCLUSIONS

Calculated LC50 (96hr) value for 2,6-Di-tert-butylphenol was found to be 7.6 mg/l.

DATA QUALITY

Information taken from the test report.

Purity of the test substance: information not available.

GLP study: no data available.

REFERENCES

Test Report on the Acute Toxicity Test of IRGANOX L 108 to Zebra-Fish (*Brachydanio rerio).* Ciba-Geigy Ltd, AD-Division, CH-4002, Basel, Switzerland.

OTHER

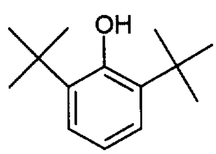
Study Ref.: 894

10.2 ACUTE TOXICITY TO FISH

TEST SUBSTANCE

2,6-Di-*tert*-butylphenol

CAS No. 128-39-2



The sample used in this study was identified to be 99.88% active ingredient (A.I.).

METHOD

Protocol for Conducting a Flow-through Acute Toxicity Test with 2,6-Di-tert-butyl phenol and Freshwater Fish (*Salmo gairdneri*) RBTFA/DTBP.
Test type: 14 day Flow-through exposure
GLP: (Y)
Year study performed: 1989

Species: Rainbow trout (*Salmo gairdneri*), obtained from a commercial supplier in California.

Analytical monitoring: All replicate treatment levels and the controls were analysed for ^{14}C-2,6-DTBP concentrations prior to the start of the definitive test. During the in-life phase of the definitive study, water samples were removed from both replicate test solutions of each treatment level and the controls on test days 0, 4, 6, 8, 12 and 14 for analysis of ^{14}C-2,6-DTBP. Each exposure solution sample was collected from the approximate midpoint of the aquarium with a volumetric pipette. Immediately after sampling, all samples were centrifuged for 25 minutes at 2000 rpm. This procedure was sufficient to remove suspended particles (≥ 0.45 microns) and absorbed test substance. In addition, quality assurance QA blind samples were prepared at each sampling interval and remained with the set of exposure solution samples through the analytical process. The QA samples were prepared in dilution water at 2,6-DTBP concentrations unknown to the analyst. Results of this analysis were used to judge the precision and quality control maintained during the analysis of exposure solution samples. All samples were analysed for ^{14}C-2,6-DTBP using radiometric procedure.

Exposure period: 14 days

Statistical methods:

The mean measured concentrations tested (day 0, 6, 8, 12 and 14) and the corresponding mortality data derived from the toxicity test were used to estimate the median lethal concentrations (LC50) and 95% confidence interval at each 24-hour interval of the exposure period. If at least one test concentration caused mortality of greater or equal to 50% of the test population, then a computer program (Stephan, 1977, 1982) was used to calculate the LC50 values and 95% confidence intervals. Three statistical methods were available in the computer program: moving average angle analysis, probit analysis and nonlinear interpolation with 95% confidence intervals calculated by binomial probability. The selection of reported LC50 values and 95% confidence intervals was based upon an examination of the data base and the results of the computer analysis. Selection criteria included the establishment of a concentration-effect relationship (mortality), the number of concentrations causing partial responses and the span of responses bracketing the LC50 value. If two or more statistical methods produced acceptable results, then the method which yielded the smallest 95% confidence intervals was selected. The No Observation Effect Concentration (NOEC) was also determined.

Protocol deviations:

The protocol states that the exposure solution samples will be passed through a 0.45 micron filter prior to analyses. During the study the exposure solution samples were centrifuged for 15 minutes at 2000 rpm. This procedure was sufficient to remove particles (0.45 microns) and sorbed substances. Preliminary investigations performed at SLS established that filtering the exposure solutions removed soluble test material.

The protocol states that the exposure solution temperatures will be maintained at 12 ± 1°C. Results of the daily measurements in each vessel demonstrated that the solution temperatures ranged from 11 - 12°C. Continuous measurements in one replicates vessel resulted in a temperature range of 10 – 12 °C.

The protocol states that the concentration of solvent in the highest test concentration will not exceed 100 µl. During the study the concentration of solvent in the highest treatment level was 446 µl acetone/l. Following consultation with EPA and the Study Sponsor, it was decided to exceed the recommended solvent limitation to allow the preparation and maintenance of consistent exposure concentration of 2,6-DTBP.

The protocol states that the TOC of the dilution water shall be measured at the beginning of the toxicity test and should not exceed 2.0 mg/l. Due to the analytical instrumentation, the samples removed at the test initiation could not be analysed. Historical values for TOC content of the dilution water averaged 4.3 ppm.

The protocol states that each replicate exposure solution will be sampled and analysed on test days 0, 4, 8, 12 and 14. Due to the lower than expected recoveries for the QA samples on day 4, additional samples were analysed on day 6. After review of the analytical data and the records describing the function of the diluter system, it was established that the results of the analysis of the solution on day 4 were not representative of the concentration of 2,6-DTBP in the exposure vessels. Therefore, mean measured concentrations for this study were based on the analyses performed on day 0, 6, 8, 12 and 14.

The protocol states that the dissolved oxygen concentration must exceed 90% at the initiation of the study and is not allowed to fall bellow 8.2 mg/l for the duration of the test. At test initiation, the dissolved oxygen concentration was 89% of saturation in one replicate (B) of the 1.5 mg A.I./l (nominal) treatment level. The dissolved oxygen concentration was equal to 90% of saturation in two additional replicate aquaria (replicate A of the 1.5 mg A.I./l nominal test concentration and replicate B of the 0.98 mg A.I./l nominal test concentration). In all remaining test aquarium, the dissolved oxygen concentration exceeded

90% of saturation at test initiation. In addition, on test days 13 and 14, the dissolved oxygen concentration fell below 8.2 mg/l. However, the dissolved oxygen concentration never fell below 7.5 mg A.I./l (69% saturation) throughout the exposure period.

RESULTS

Nominal concentrations: 1.5, 0.98, 0.63, 0.41 and 0.27 mg A.I./l

Mean measured concentrations: 1.0, 0.66, 0.43, 0.28 and 0.21 mg A.I./l

All results are expressed in mg A.I./l

LC50 values for exposure days 1 – 6 were empirically estimated as being greater than the highest mean measured concentration: LC50 > 1.0 mg A.I./l

LC50 values with 95% confidence intervals, calculated by moving average angle analysis:

LC50 (7-day), 0.89 mg A.I./l (0.78 – 1.1)

LC50 (8-day), 0.87 mg A.I./l (0.77 – 1.0)

LC50 (9-day), 0.83 mg A.I./l (0.75 – 0.93)

LC50 (10-day), 0.83 mg A.I./l (0.75 – 0.93)

LC50 (11-day), 0.81 mg A.I./l (0.70 – 1.0)

LC50 (12-day), 0.74 mg A.I./l (0.66 – 0.95)

LC50 (13-day), 0.89 mg A.I./l (0.66 – 0.85)

LC50 (14-day), 0.74 mg A.I./l (0.66 – 0.85)

Following 14 day exposure, 95% mortality was observed at the highest test concentration. Mortality of 20, 10, 65 & 20% was observed at the remaining lower treatment levels.

Due to the inversion of the concentration–effect relationship (65% mortality at 0.28 mg A.I./l and 10% mortality at 0.43 mg A.I./l), the reported 95% confidence intervals may not accurately reflect this statistic.

NOEC (14 day) < 0.21 mg A.I./l

Remarks:

Biological observations were made twice daily during the definitive study. Mortalities were recorded and removed from each aquarium every 24 hours during the exposure.

Throughout the exposure period, a small amount of precipitate was observed in the diluter system's mixing chamber. However, no undissolved 2,6-DTBP (e.g., precipitate film on solution surface) was observed in any of the exposure vessels during the study. The diluter system functioned properly.

Mean measured concentrations (mg A.I./l) and cumulative mortalities (%) during the 14 day flow-through study:

0.21 mg A.I./l; 0% (day 1), 5% (day 2 & 3), 10% (day 4), 20% (days 5 to 14)

0.28 mg A.I./l; 5% (day 1), 25% (day 2), 30% (day 3), 65% (days 4 to 14)

0.43 mg A.I./l; 5% (day 1), 10% (days 2 to 14)

0.66 mg A.I./l; 0% (day 1), 10% (day 2), 15% (day 3 to 10), 20% (days 11 to 14)

1.0 mg A.I./l; 0% (day 1), 5% (day 2), 20% (day 3), 35% (day 4), 40% (day 5), 45% (day 6), 65% (day 7), 70% (day 8), 80% (days 9 to 11), 95% (day 12 to 14)

Solvent control; 0% (days 1 to 14)

Control; 0% (days 1 to 14)

CONCLUSIONS

Based on a comparison of the 7- and 14- day LC50 values (0.89 and 0.74 mg A.I./l respectively), 2,6-DTBP does not appear to be chronically toxic to rainbow trout (*Salmo gairdneri*).

DATA QUALITY

GLP study

Information taken from the test report.

REFERENCES

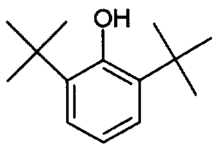
Acute Toxicity of 2,6-Di-*tert*-butyl phenol (2,6-DTBP) to rainbow trout (*Salmo gairdneri*), during a 14 day study under flow-trough conditions. Springborn Laboratories Inc, 790 Main Street, Wareham, Massachusetts 02571, USA.

10.3 ACUTE TOXICITY TO FISH

TEST SUBSTANCE

2,6-Di-*tert-butylphenol*

CAS No. 128-39-2



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Fish

Exposure period: 96 hours, 30 days and 90 days

RESULTS

LC50 (96hr) 0.90 mg/l

ChV (30 day) 0.13 mg/l

ChV (90 day) 0.019 mg/l

Remark: log Kow used 4.48 (calculated value)

CONCLUSIONS

Estimated LC50 (96hr) for the test substance was found to be 0.90 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v.0.99e

OTHER

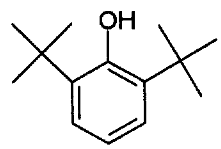
Calculation performed for this HPV submission.

10.4 ACUTE TOXICITY TO FISH

TEST SUBSTANCE

2,6-Di-*tert*-butylphenol

CAS No. 128-39-2



Purity of the test substance given as 99.88%.

METHOD

Acute Toxicity to Fish
Test type: Flow-through
GLP: (Y)
Year study performed: 1989

Species: Rainbow trout (*Oncorhynchus mykiss*)

Solvent: Acetone

Exposure period: 4 to 14 days

Concentration:

0.74 – 1.0 mg/l

Doses of 0.89 mg/l were also tested for 7 days.

RESULTS

LC50 (96hr) > 0.1 mg/l

LC50 (7days) 0.89 mg/l

LC50 (14days) 0.74 mg/l

CONCLUSIONS

TheLC50 (96hr) for the test substance was found to be greater than 0.1 mg/l.

DATA QUALITY

GLP study

Information taken from the OECD/SIDS data set.

REFERENCES

Primary reference:

Ethyl Corporation. Unpublished Report-Ethyl Corporation, 89-05-2948, (1989)

Secondary reference:

OECD/SIDS. Screening information Data Set (SIDS) of OECD High Production Volume Chemicals Programme, (1994)

OTHER

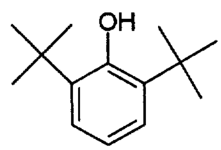
Study Ref.: IRPTC Data Profile

11.1 ACUTE TOXICITY TO ALGAE

TEST SUBSTANCE

2,6-Di-*tert*-butylphenol

CAS No. 128-39-2



The test substance used in this report was 99.88% active ingredient (A. I.), a white gelatinous, viscous liquid received from Ethyl Corporation. After storage at room temperature, the liquid became a crystalline solid. The solid form of 2,6-Di-*tertiary* butylphenol was used in this study.

The radiolabelled material, a yellow-green-coloured crystalline solid, was received as [Ring-U-^{14}C] 2,6-Di-tertiary butylphenol (0.89 mCi/mmole) in three vials. Prior to testing, the 2,6-Di-tertiary butylphenol was stored under refrigerated conditions at 4°C.

METHOD

"96-Hour Toxicity Test with Freshwater Alga, *Selenastrum capricornutum*". EPA TSCA Guideline 797.1050 as amended on 20th May 1987 (U.S. EPA, 1987).
Test type: Static
GLP: (Y)
Year study performed: 1988

Species/strain:

Freshwater green alga *Selenastrum capricornutum*, obtained from Carolina Biological Supply Company, Burlington, North Carolina and maintained in stock culture at SLS.

Element basis:

Reduction in cell density (relative to the control).

Test duration:

96 hours (17 –21 October 1988)

Analytical monitoring:

At 24, 48, 72 and 96 hours, cells counts were conducted for each replicate vessel using a haemacytometer and microscope. When possible, approximately 400 cells per replicate were counted to provide ± 10% accuracy at the 95% confidence level. At test initiation samples were removed from each of the 500 ml volumetric flasks of each treatment level and controls for analysis. At test termination 0.5 ml was removed from each replicate of the lowest test concentration which completely inhibited algal growth, or of the highest test concentration in which growth inhibition occurred. The 1.5 ml of combined subsample was diluted with sterile MBL medium (pH adjusted to 7.5) to prepare a subculture with a 2,6-DTBP concentration equal to the highest test concentration in which growth inhibition was not observed. This subculture was used to determine if the effects of the test material on algae were algistatic (in which case cells would resume growth in the subculture) or algicidal (no growth would occur in the subculture). The subculture was incubated under the test conditions for up to 9 days or until growth was observed (as determined by daily cell counts). At the test termination, after the 0.5 ml subsamples had been taken for subculturing, the contents of the three replicates of each test concentration were combined for 2,6-DTBP analysis. The pooled test solutions were filtered through 0.45 µm membrane filters, and both filters and filtrates were radioassayed for 2,6-DTBP.

Statistical methods:

EC10, EC50 and EC90 values and their 95% confidence limits were determined by linear regression of response (percent reduction of cell density, as compared to controls) vs. nominal exposure concentration over the range of test concentrations where a clear exposure-response relationship was observed. Four linear regressions were estimated based on untransformed data, untransformed response vs. logarithm-transformed concentration, probit-transformed response vs. untransformed concentration and probit-transformed response vs. logarithm-transformed concentration. The regression that best fitted the data was selected based on the highest coefficient of determination (r). This regression equation was then applied to estimate the EC10, EC50 and EC90 values and their 95% confidence limits, using the method of inverse prediction (Sokal and Rohif, 1981). A computer program developed and validated at SLS was used to assist in these computations.

Deviations to protocol:

According to protocol the algae cultures are transferred into fresh medium regularly to provide six- to eight-day-old inoculum cultures. For this test the algae, which had been cultured in MBL medium were transferred into fresh medium five days prior to testing.

According to the protocol, the algal cultures and test cultures are maintained at a temperature of 24 ± 1°C. In this test, temperature ranged from 22 to 24°C.

The protocol states that at test termination, a 0.5 ml sample of culture is taken from each replicate of the lowest test concentration that completely inhibited algae growth to differentiate between algistatic and algicidal effects. During this study 1.0 ml from each replicate of an additional concentration, which severely inhibited growth, was taken as well.

Test conditions:

An inoculum of *Selenastrum capricornutum* cells calculated to provide 1 x 10^4 cells/ml (95% confidence interval 0.74 –1.26 x 10^4 cells/ml) was aseptically introduced to each flask. All flasks were than placed in an environmental chamber where the temperature was maintained at 22-24° C. The flasks were impartially placed on the shaker, at the shaking rate of 100 rpm and were returned to the same position on the shaker after each daily observation. Lighting was provided continuously at intensity of 5,000 lux at the solution surface.

The MBL test medium used to prepare the exposure solutions was formulated in the same manner as the culture medium (excluding Na_2EDTA). The pH of this medium was adjusted to 7.5 ± 1 with 0.1 N hydrochloric acid.

Controls used in this test were controls (MBL medium) plus solvent (acetone) controls. The flask contained 50 µl of acetone (the greatest amount of solvent). Replicate sterile 125-ml flasks (3 per treatment level and the controls) were conditioned by rising with the appropriate test solution. 50 ml of the appropriate test solution were then placed in each replicate flask. Control flasks were prepared and maintained under the same conditions as test flasks containing 2,6-DTBP. The opening of each flask was covered with a stainless steel cap to permit gas change.

pH at test initiation was 7.4 and at test termination pH ranged from 7.2 to 9.8.

RESULTS

Based on the results of a range-finding toxicity test, the nominal concentrations were 0.64, 1.3, 2.5, 5.0 and 10 mg/l.

Measured concentrations at test initiation ranged from 34 to 48% of nominal concentrations. Concentrations at 96 hours were extremely low, near the limits of detection of the analysis.

Based on mean of 0-hour and 96-hour analysis, the concentrations of 2,6-DTBP in this test were 0.11, 0.24, 0.51, 1.23 and 2.17 mg/l. In general, cell counts were relatively consistent among replicates at each test concentration. The exposure-response relationship was clearly defined, with the threshold for inhibition between mean measured concentrations of 1.23 and 5.1 mg/l. For counts made at 24, 72 and 96 hours, there were no significant differences in cell densities between controls and solvent controls, and the two sets of controls were combined for EC50 calculations. For counts made at 48 hours, cell densities were significantly higher in the solvent controls than in the controls, and EC50 values were based on the solvent controls.

Results based on mean measured concentrations with 95% confidence limits:

24-hour EC10 value, 0.36 mg/l (0.16-0.80 mg/l)

24-hour EC50 value, 0.86 mg/l (0.39-1.9 mg/l)

24-hour EC90 value, 2.2 mg/l (0.98-5.3 mg/l)

48-hour EC10 value, 0.16 mg/l (0.06-0.37 mg/l)

48-hour EC50 value, 0.50 mg/l (0.20-1.2 mg/l)

48-hour EC90 value, 1.6 mg/l (0.66-4.1 mg/l)

72-hour EC10 value, 0.29 mg/l (0.15-0.54 mg/l)

72-hour EC50 value, 0.51 mg/l (0.28-0.96 mg/l)

72-hour EC90 value, 0.96 mg/l (0.52-1.8 mg/l)

96-hour EC10 value, 0.18 mg/l (0.05-0.57 mg/l)

96 hours EC50 value, 0.56 mg/l (0.17-1.9 mg/l)

96-hour EC90 value, 1.7 mg/l (0.56-6.5 mg/l)

The control response was satisfactory.

The amount of filterable 2,6-DTBP at 96 hours could not be calculated precisely because the volume of culture filtered was not measured, but the total amounts of 2,6-DTBP on the filters were very low, ranging from 0.56 μg to 6.12 μg. Assuming that the volume filtered was between 50 and 100 ml, the amounts of 2,6-DTBP recovered on the filters correspond to a very small fraction of 2,6-DTBP initially present – i. e. filterable 2,6-DTBP was 0.0056 – 0.011 mg/l in the nominal 0.64 mg/l solution, and 0.061 – 0.12 mg/l in the nominal 10 mg/l solution. The loss of the test substance from the test solutions between 0 and 96 hours is unexplained. It is possible that the unaccounted 2,6-DTBP was present as undissolved material that settled to the bottom of the test vessels and was not included in the samples removed for filtration. Very little of the test material remained in solution at the termination of the study. The TSCA guidelines (797.1050) acknowledge that "For Chemicals with low solubility under test conditions, it may not be possible to quantitatively determine the EC50 value" (U.S. EPA, 1985).

CONCLUSIONS

Since it was established during this study that 2,6-DTBP was unstable in test solutions, it was not possible to quantitatively determine an EC50 value. The test substance caused reduction in cell density, relative to control in the toxicity test with the freshwater green alga *Selenastrum capricornutum*.

The regrowth of the algal subcultures indicated that the effects of 2,6-DTBP on *Selenastrum capricornutum* were algistatic, not algicidal.

DATA QUALITY

GLP study

Information taken from the test report.

REFERENCES

Toxicity Test with Freshwater Green Alga *Selenastrum capricornutum,* Springborn Laboratories, Inc., Environmental Sciences Division, 790 Main Street, Wareham, Massachusetts 02571, USA.

OTHER

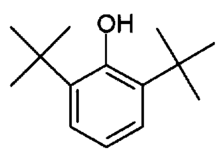
Study Ref.: 88-11-2846

11.2 ACUTE TOXICITY TO ALGAE

TEST SUBSTANCE

2,6-Di-*tert-butylphenol*

CAS No. 128-39-2



The test material was received in radiolabelled and nonradiolabelled form. A sample of 2,6-DTBP, a pale yellow crystalline solid identified by the sponsor to be 99.86% active ingredient, was received from Ethyl Corporation, Lousiana. This material was stored at room temperature ~ 20°C in the dark until use in the toxicity test.

METHOD

"96-Hour Acute Toxicity Test with Freshwater Alga, *Selenastrum capricornutum*". EPA TSCA 797-1050", as amended on 20th May 1987 (U.S. EPA, 1987).
Test type: Static
GLP: (Y)
Year study performed: 1991

Species/strain:

Freshwater green alga *Selenastrum capricornutum*; obtained from Carolina Biological Supply Company, North Carolina and maintained in stock culture at SLI.

Element basis:

Reduction in cell density after 24, 48, 72 and 96 hours of exposure (relative to the control).

Test duration:

96 hours (17-21 June 1991)

Analytical monitoring:

At test initiation, samples were collected form the volumetric flasks used to prepare the test solutions and analysed for 2,6-DTBP. At each 24-hour interval, three replicates from each test concentration, controls and solvent control were selected impartially. Aliquots of approximately 50 ml were removed from each of the three replicates and analysed. One of the nine 1.0 mg/A.I./l flasks (without algal inoculum) was sampled at test initiation for 2,6-DTBP analysis and the results used to determine the loss of 2,6-DTBP from solution in the absence of algae. All solutions were analysed using HPLC-UV (high performance liquid chromatography – ultraviolet detection HPLC-RAM (high performance liquid chromatography – radiometric) detection and LSC (liquid scintillation counting). A time-weighted average concentration was calculated for each set of test solutions at each sampling interval. Each time-weighted average was calculated by averaging measurement for that interval with measurements made at the previous intervals.

Statistical methods:

The first stage of statistical analysis was comparison of control cell densities with solvent control densities for each sampling interval, using Student's T -test (Sokal and Rohlf, 1981). EC50 values based on initial measured concentrations and on time-weighted average concentrations were calculated from cell densities observed after 24, 48, 72 and 96 hours of exposure. For each observation period, the EC10, EC50 and EC90 values and their 95% confidence limits were determined by linear regression of response vs. the initial time-weighted average concentration over the range of test concentrations where a clear exposure-response relationship was observed. Four linear regressions were estimated based on a) untransformed data, b) untransformed response vs. logarithm-transformed concentration, c) probit-transformed response vs. untransformed concentration and d) probit-transformed response vs. logarithm-transformed concentration. The regression that best fitted the data was selected based on the highest coefficient of determination (r^2). This regression equation was then applied to estimate the EC values and their 95% confidence limits, using the method of inverse prediction (Sokal and Rohlf, 1981). The No Observed Effect Concentration (NOEC) based on initial measured concentrations and time-weighted average concentrations was determined using one-way analysis of variance (Sokal and Rohlf, 1981) and Dunnett's Test (Dunnett 1955, 1964) if all groups had equal numbers of replicates (i.e., if control data were not pooled), or using Bonferroni's Test (Weber, et *al.*, 1989) if the groups had unequal numbers of replicates (i.e., if control data were pooled). Before conducting the analysis of variance, data were checked for normality using the Chi-Square test (Sokal and Rohlf, 1981) and for homogeneity of variance using the Hartley test (Neter et *al.*, 1985). If the assumptions of normality and homogeneity of variance were not met, the NOEC was determined using the non-parametric Kruskal-Wallis Test (Sokal and Rohlf, 1981).

Deviations to protocol:

The protocol states that cell counts will be determined daily in the reference control solution. The reference control solutions were inadvertently not counted on day 1.

The protocol states that the analytical samples will be centrifuged prior to analysis. During the study, centrifugation of the samples was not needed because algal densities were low and did not interfere with direct injection HPLC analysis.

The protocol states that the method of choice for measurement of 2,6-DTBP is HPLC using direct aqueous injection followed by RAM. During the study HPLC using direct aqueous injection and UV detection was performed at each interval in addition to HPLC-RAM used for analysis on days 0 and 1 and which indicated that no radiolabelled degradates were detectable in the test solutions. LSC method was used to detect total ^{14}C-residues on days 2,3 and 4. The test concentrations fell below the detection limit of HPLC-RAM.

The protocol states that the mass balance will be reported. Mass balance of test material was not determined during this study.

The protocol states that control solutions and QC spikes will be analysed at each interval. QC samples were not analysed by LSC on days 2 through 4. However LSC results are similar to HPLC-UV results.

The protocol states that no EDTA is added to the test medium. Based on a request from U.S. EPA, Na_2EDTA. H_2O was added to the test medium at a concentration of 0.38 mg/l. The protocol states that each test concentration will be analytically confirmed.

These deviations did not affect the results of the test.

The culture medium used was Marine Biological Laboratory (MBL) medium prepared with distilled water. The pH of this medium was adjusted to 7.5 ± 1. Stock cultures were grown in 125 ml glass flasks containing 50 ml of medium.

Test conditions:

During the 96 hour test, the temperature was maintained at 23 - 25°C. The flasks shaking rate was maintained at 100 rpm. Lighting was provided continuously by a combination of fluorescent light. The light was 300 to 400 f. candles.

The stock cultures were maintained under test conditions (shaking rate of 100rpm, temperature of 23 - 25°C, continuous illumination at the surface of approximately 375 to 500 f. candles).

The control solution was prepared containing algal growth medium only. In addition, a solvent control solution was prepared containing 0.10 ml/l acetone, equal to the concentration of acetone present in each test solution.

pH at test initiation was 7.5 and at termination pH ranged from 7.9 to 9.7.

A radiolabelled stock solution was prepared by quantitative transfer of the entire amount of ^{14}C-DTBP (1.159 g) in one vial into a 25-l volumetric flask and diluting to volume with acetone. Radiochemical purity of this stock solution was determined to be 97.4% using HPLC with RAM detection. A nonradiolabelled stock solution of 158 mg A.I./ml was prepared by weighing 1.5824 g (1.5802 g A.I.) 2,6-DTBP into a sterile 10-ml flask and diluting to volume with acetone. A second nonlabelled stock solution of 58.1 mg A.I./ml was prepared. Seventy-two test vessels (twelve replicates for each test concentration, control and solvent control) were conditioned by rinsing with the appropriate test solution, control solution or solvent control solution. Nine additional flasks, identical to the exposure vessels, were prepared with 100 ml of the 1.0 mg A.I./l (nominal) solution for determination of 2,6-DTBP concentrations in the absence of algae.

Guideline requirements and modifications:

Requirement: Test solution volume does not exceed 50% of the flask volume. Modification: Test solution volume was 100 ml maintained in 125-ml Erlenmeyer flask.

Requirement: Vessel caps which allow gas exchange. Modification: Special exposure systems were use to minimise loss of 2,6-DTBP from the test solutions. Exposure vessels were 125-ml glass Erlenmeyer flasks with teflon-coated stoppers.

Requirement: Provide an additional exposure at termination of the 96-hour exposure to determine algicidal/algistatic effects of the test material. Modification: Algicidal/algistatic properties of the test material were not investigated at termination of the 96-hour exposure. The exposure concentrations had declined to levels where this investigation was not meaningful.

Requirement: The concentration of the test chemical in the test containers should be determined at the beginning and end of the test. Modification: Based on previous testing, there was potential for the test material concentrations to decline rapidly in the exposure. Therefore, test solution samples were collected daily for analysis to better define the exposure concentrations. Additionally, the study results are presented on initial exposure concentrations and the time-weighted average (T.W.A.). The T.W.A. concentrations were calculated by averaging the measurements for the time interval with the measurement from the previous interval(s).

Additional modifications of the guideline requirements:

Requirement: Algal stock cultures should be shaken twice daily by hand. Test cultures should be oscillated on a rotary shaker at 100 rpm. Modification: Stock cultures were maintained, as were the test cultures, on a rotary shaker at 100rpm.

Requirement: No chelating agents are to be included in the nutrient medium used for test solution preparation. Modification: Based on a recent request by U.S. EPA, $Na_2EDTA \cdot 2H_2O$ was added to the test medium at a concentration of 0.38 mg/l to promote algal growth.

Requirement: Designation of the test organism strain. Modification: The strain is not available for the test species *Selenastrum capricornutum*.

RESULTS

Nominal concentrations of 10, 5.0, 2.5, 1.3, 0.63 and 0.33 mg A.I./l were selected for the definitive test.

Initial measured concentrations used in this test were: 7.2, 2.9, 2.1, 1.2, 0.63 and 0.33 mg A.I./l. (85%of nominal on average).

Time-weighted average concentrations were: 2.2, 0.95, 0.64, 0.34, 0.18 and 0.086 mg A.I./l

All results are expressed in mg A.I./l (based on HPLC-UV analysis):

Results based on initial measured concentrations with 95% confidence limits:

24-hour EC10 value, 1.5 mg A.I./l (-3.2 – 2.3 mg A.I./l)

24-hour EC50 value, 2.3 mg A.I./l (0.46 – 3.5 mg A.I./l)

24-hour EC90 value, 3.2 mg A.I./l (2.4 – 6.7 mg A.I./l)

48-hour EC10 value, 1.7 mg A.I./l (0.20 – 4.5 mg A.I./l)

48-hour EC50 value, 3.5 mg A.I./l (1.0 – 12 mg A.I./l)

48-hour EC90 value, 7.1 mg A.I./l (2.6 – 41 mg A.I./l)

72-hour EC10 value, 1.7 mg A.I./l (0.71 – 4.2 mg A.I./l)

72-hour EC50 value, 3.6 mg A.I./l (1.5 – 9.3 mg A.I./l)

72-hour EC90 value, 7.5 mg A.I./l (3.2 – 22 mg A.I./l)

96-hour EC10 value, 0.98 mg A.I./l (–1.2 – 3.0 mg A.I./l)

96-hour EC50 value, 3.9 mg A.I./l (1.9 – 6.1 mg A.I./l)

96-hour EC90 value, 6.9 mg A.I./l (4.8 – 9.3 mg A.I./l)

Results based on time-weighted average concentration with 95% confidence limits:

24-hour EC10 value, 1.0 mg A.I./l (–2.4 – 1.7 mg A.I./l)

24-hour EC50 value, 1.7 mg A.I./l (0.27 – 2.5 mg A.I./l)

24-hour EC90 value, 2.3 mg A.I./l (1.7 – 5.0 mg A.I./l)

48-hour EC10 value, 0.85 mg A.I./l (0.20 – 2.1 mg A.I./l)

48-hour EC50 value, 1.7 mg A.I./l (0.59 – 4.8 mg A.I./l)

48-hour EC90 value 3.4 mg A.I./l (1.4 – 14 mg A.I./l)

72-hour EC10 value, 0.65 mg A.I./l (0.26 – 1.6 mg A.I./l)

72-hour EC50 value, 1.4 mg A.I./l (0.58 – 3.6 mg A.I./l)

72-hour EC90 value, 3.0 mg A.I./l (1.2 – 8.6 mg A.I./l)

96-hour EC10 value, 0.30 mg A.I./l (–0.31 – 0.87 mg A.I./l)

96-hour EC50 value, 1.2 mg A.I./l (0.63 – 1.8 mg A.I./l)

96-hour EC90 value, 2.1 mg A.I./l (1.5 – 2.8 mg A.I./l)

The 96-hour NOEC value based on initial measured concentration was 2.1 mg A.I./l and 0.64 mg A.I/l based on time weighted average concentration.

All measured concentrations decreased over time. At test termination, only the two highest test concentrations contained measurable amounts of test material (detection limit = 0.025 mg A.I./l). Test vessels containing 1.0 mg A.I./l solutions, but without algae, were analysed at 0, 2, 4, 8, 12, 24, 48, 72 and 96 hours to determine the loss of 2,6-DTBP in the absence of algae. After 4 hours, measured concentrations in these solutions declined faster than those in the test solutions containing algae. The decline in concentrations of 2,6-DTBP was apparently not caused by the algae in those solutions.

The HPLC-RAM analysis of the test solutions was performed to confirm the HPLC-UV analytical results and identify any radiolabelled degradates of 2,6-DTBP. The resultant measured concentrations were similar to those determined by HPLC-UV analyses. Although the concentrations of 2,6-DTBP decreased over time, no radiolabelled degradates were detected. It is inferred that the degradates of 2,6-DTBP in water were volatile and were released to the headspace above the test solution. Because all of the ^{14}C in the test solutions occurred as 2,6-DTBP, total ^{14}C measurement using LSC were employed for analysis of the 48, 72 and 96-hour samples to maximise the analytical sensitivity.

The disappearance half-life of 2,6-DTBP in each test concentration was calculated from the slope of the log concentration vs. time regression. The half-life of the test material ranged from 14 to 17 hours. The half-life of the un-inoculated 1.0 mg A.I./l test solutions was estimated to be 8.4 hours.

Cell density results:

Cell density for each flask at 24, 48, 72 and 96 hours was respectively:

7.2 mg A.I./l initial measured concentration: 2, 2, 1, 2 (x 10^4 cells/ml)

2.9 mg A.I./l initial measured concentration: 1, 7, 6, 9 (x 10^4 cells/ml)

2.1 mg A.I./l initial measured concentration: 4, 14, 15, 18 (x 10^4 cells/ml)

1.2 mg A.I./l initial measured concentration: 4, 13, 16, 18 (x 10^4 cells/ml)

0.63 mg A.I./l initial measured concentration: 3, 13, 19, 19 (x 10^4 cells/ml)

0.33 mg A.I./l initial measured concentration: 5, 14, 18, 20 (x 10^4 cells/ml)

Solvent control: 6, 16, 14, 21 (x 10^4 cells/ml)

Control: 6, 16, 14, 19 (x 10^4 cells/ml)

Pooled control: 6, 16, 14, 20 (x 10^4 cells/ml)

Reference culture: not performed at the 24-hour interval, 10, 29, 83 (x 10^4 cells/ml)

Control response was satisfactory.

Control culture averaged 19 x 10^4 cells/ml at 96 hours and solvent control cultures averaged 21 x 10^4 cells/ml. Cell densities in the reference cultures averaged 83 x 10^4 cells/ml at 96 hours. The lower densities observed in the controls and solvent controls presumably reflect carbon dioxide limitation in the sealed flask. Cell densities in the cultures exposed to 2,6-DTBP ranged from 2 to 20 x 10^4 cells/ml at 96 hours and generally followed the concentration gradient. Cell growth was not completely inhibited in any of the concentrations tested.

CONCLUSIONS

Based on time-weighted average concentrations the 96-hour EC50 value was 1.2 mg A.I./l and the 96-hour NOEC value 0.64 mg A.I./l.

DATA QUALITY

GLP study

Method follows EPA/TSCA guideline.

Information taken from the test report.

REFERENCES

2,6-Di-tert-butylphenol (DTBP) – Toxicity to the Freshwater Green Alga, *Selenastrum capricornutum* (final report) with attachments and covering letter dated 11.07.91

OTHER

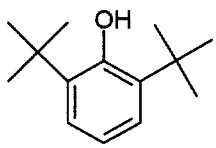
Study Ref.: 91-7-3822, Springborn Laboratories, Inc., Environmental Sciences Division, 790 Main Street, Wareham, Massachusettes 02571, USA.

11.3 ACUTE TOXICITY TO ALGAE

TEST SUBSTANCE

2,6-Di-*tert*-butylphenol

CAS No. 128-39-2



Purity of the test substance: information not available.

METHOD

Toxicity to Aquatic Plants
Test type: Data not available
GLP: (Y)
Species/strain: Algae (*Selenastrum capricornutum*)
Year study performed: 1994

RESULTS

Two attempts were made to test algal toxicity in response to the U.S. EPA proposed Test Rule for 2,6-DTBP. Both studies were found to be unacceptable, because stable test concentrations could not be maintained during the test period. EPA's Environmental Effects Branch finally concluded that a meaningful DTBP toxicity value for algae cannot be attained using the current or modified OPPT test guideline and EPA decided that no additional algal testing would be required.

CONCLUSIONS

No toxicity value for 2,6-DTBP was obtained in this test.

DATA QUALITY

GLP study

Information taken from the OECD/SIDS data set.

Purity of the test substance: information not available.

REFERENCES

Secondary reference:

OECD/SIDS. Screening Information Data Set (SIDS) of OECD High Production Volume Chemicals Programme, (1994)

OTHER

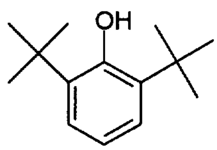
Study Ref.: IRPTC Data Profile

11.4 ACUTE TOXICITY TO ALGAE

TEST SUBSTANCE

2,6-Di-*tert*-butylphenol

CAS No. 128-39-2



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Exposure period: 96 hours

RESULTS

EC50 (96hr) 0.65 mg/l

ChV (96hr) 0.27 mg/l

Remarks: log Kow used 4.48 (calculated value)

CONCLUSIONS

Estimated EC50 (96hr) for the test substance was found to be 0.65 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v. 0.99e

OTHER

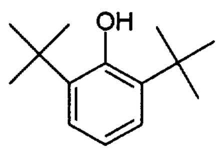
Calculation performed for this HPV submission.

12.1 ACUTE TOXICITY TO AQUATIC INVERTEBRATES (E.G., DAPHNIA)

TEST SUBSTANCE

2,6-Di-*tert-butylphenol*

CAS No. 128-39-2



The test substance used in this test was 98.4% pure.

The test substance was identified on the basis of the code number. The characterisation and analysis were not part of the study.

METHOD

OECD Guideline No. 202 Acute Toxicity to *Daphnia magna* (24 hr)
Test type: Static
GLP: Data not available
Year study performed: 1987

Species: *Daphnia magna* Straus 1820

Analytical procedures: Data not available

Test details: The test was conducted under static conditions, in beakers covered with watch glasses.

Statistical methods: The EC50 values were calculated according to J. Berkson, Jasa 48 (1953), 569-599. EC50 was graphically determined on gausso-logarithmic probability paper.

RESULTS

Nominal concentrations: 0.58, 1.00, 1.80, 3.20 and 5.30 mg/l

All results are expressed in mg/l and are based on the nominal concentrations.

Calculated EC50 value with 95% confidence limits:

EC50 (24hr) 1.7 mg/l (1.5-2.0 mg/l)

Graphically determined EC0, EC50 and EC100 values:

EC0(24hr)	0.58 mg/l
EC50(24hr)	1.8 mg/l
EC100(24hr)	5.8 mg/l

Number immobilised as compared to the number exposed to nominal concentrations:

0.58 mg/l :	0/20 (0%)
1.0 mg/l:	1/20 (5%)
1.80 mg/l:	14/20 (70%)
3.20 mg/l :	15/20 (75%)
5.80 mg/l :	20/20 (100%)

Controls: immobilisation blank 0/20 (0%)

immobilisation vehicle 0/20 (0%)

Control response was satisfactory.

CONCLUSIONS

Calculated EC50 (24hr) value for 2,6-Di-tert-butylphenol was found to be 1.7 mg/l.

DATA QUALITY

Method follows OECD guideline.

Information taken from the test report.

GLP study: data not available

REFERENCES

Report on the test for acute toxicity of TK 12891 to *Daphnia magna,* Ciba-Geigy Ltd, AD-Division, CH-4002, Basel, Switzerland.

OTHER

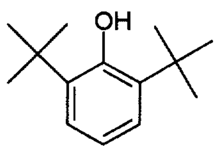
Study Ref.: 87 40 57

12.2 ACUTE TOXICITY TO AQUATIC INVERTEBRATES (E.G., DAPHNIA)

TEST SUBSTANCE

2,6-Di-*tert-butylphenol*

CAS No. 128-39-2



METHOD

Acute Toxicity to *Daphnia magna* (24 hr) Official Journal of the European Communities L251C-02, 19.9.1984
Test type: Static
GLP: Data not available
Year study performed: 1990

Species: *Daphnia magna* Straus 1820

Analytical procedures: Data not available.

Remarks: Small parts of test substance were floating at the surface of the test vessels at 10 and 18 mg/l after 24 hours.

Test details: The test was conducted under static conditions, in beakers covered with watch glasses.

Statistical methods: The EC50 values were calculated according to the maximum likelihood method probit model (Mc Cullagh, P., Nelder, J.A., 1983: Generalised linear models, Chapman & Hall, London).

EC values were graphically determined on gausso-logarithmic probability paper.

There were no deviations to protocol.

RESULTS

Nominal concentrations: 0.32, 0.58, 1.0, 1.8, 3.2, 5.8, 10 and 18 mg/l

All results are expressed in mg/l and are based on nominal concentrations.

Calculated EC50 value with 95% confidence limits:

EC50 (24hr) 5.5 mg/l (4.5-6.6 mg/l)

Graphically determined EC0, EC50 and EC100 values:

EC0 (24hr)	1.8 mg/l
EC50 (24hr)	5.0 mg/l
EC100 (24hr)	18 mg/l

Number immobilised as compared to the number exposed to nominal concentrations:

0.32 mg/l :	0/20 (0%)
0.58 mg/l:	0/20 (0%)
1.0 mg/l:	0/20 (0%)
1.8 mg/l :	0/20 (0%)
3.2 mg/l :	2/20 (10%)
5.8 mg/l :	15/20 (75%)
10 mg/l:	15/20 (75%)
18 mg/l:	20/20 (100%)

Controls: immobilisation blank 0/20 (0%)

immobilisation vehicle 0/20 (0%)

Control response was satisfactory.

CONCLUSIONS

Calculated EC50 (24hr) value for 2,6-Di-*tert*-butylphenol was found to be 5.5 mg/l.

DATA QUALITY

Information taken from the test report.

Purity of the test substance: information not available.

GLP study: no data available.

REFERENCES

Report on the acute toxicity test of IRGANOX 108 to *Daphnia* (*Daphnia magna* Straus 1820), Ciba-Geigy Ltd, AD-Division, CH-4002, Basel, Switzerland.

OTHER

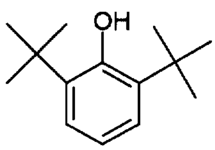
Study Ref.: 094580

12.3 ACUTE TOXICITY TO AQUATIC INVERTEBRATES (E.G., DAPHNIA)

TEST SUBSTANCE

2,6-Di-*tert-butylphenol*

CAS No. 128-39-2



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Daphnid

Exposure period: 48 hours, 21 days

RESULTS

LC50 (48hr) 1.1 mg/l
ChV (21day) 0.098 mg/l

Remark: log Kow used 4.48 (calculated value)

CONCLUSIONS

Estimated LC50 (48hr) for the test substance was found to be 1.1 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v. 0.99e

OTHER

Calculation performed for this HPV submission.

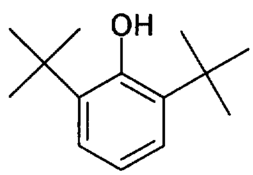
HEALTH ELEMENTS

13.1 ACUTE TOXICITY
ORAL

TEST SUBSTANCE

2,6-Di-*tert* butylphenol

CAS No. 128-39-2



No information is provided concerning the degree of purity of the material or the impurities used in the test.

METHOD

Interstate Commerce Commission, Tariff No. 8 Section 73.343 Acute Oral Toxicity Test
GLP: (N)
Year study performed: 1955

Species: Rat

Sex: Female

No of animals per sex per dose: 10

Vehicle: Substance as such

Route of administration: Oral gavage

Remarks: Ten rats were given 0.2 ml of the test substance maintained at 38°C, per kg of body weight, by means of a blunt needle which traversed the oesophagus.

RESULTS

All animals survived and showed no signs of illness, other than slight losses in body weight gain.

LD50 7ml/kg (6286 mg/kg) approximate

CONCLUSIONS

2,6 di-tertiary butyl phenol was far less toxic then the di-iso-propyl phenol when administered orally to rats.

Information in this test report may not be acceptable due to deficiency of data element. However, this test will be retained in the file for valuable comparison and overall evaluation of toxicity of the test material.

DATA QUALITY

Very old study with no GLP.

REFERENCES

The Immediate Toxicity of 2,6-Diisopropylphenol and 2,6-Di-tertiary Butyl Phenol, in Relation to the Regulations of the Interstate Commerce Commission for the Transport of Chemicals. Kettering Laboratory, Dept of Preventative Medicine and Industrial Health, College of Medicine, University of Cincinnati, Cincinnati, Ohio, USA.

OTHER

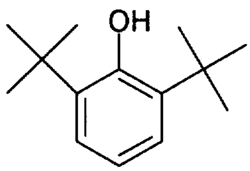
Ref: 42096 B3-8

13.2 ACUTE TOXICITY
ORAL

TEST SUBSTANCE

2,6-Di-*tert* butylphenol

CAS No. 128-39-2



METHOD

OECD Guidelines No. 401
GLP: (Y)
Year study performed: 1991

Species: Sprague-Dawley strain rat

Sex: Males and females

No of animals per sex per dose: 5000 mg/kg, Five males/five females

Vehicle: The test material was prepared, as a solution/suspension at the appropriate concentration in Arachis oil B.P. Homogeneity was assured by the use of a Silverson Homogeniser.

Route of administration: Oral, gavage

Remarks: At the start of the main study the animals were approximately five to eight weeks old. Following the range finding study, a group of ten fasted animals were given a single oral dose of the test material, as a solution/suspension in Arachis oil B.P. at a dose level of 5000 mg/kg. Animals were observed for fourteen days.

RESULTS

LD50 value of the test material was found to be greater then 5000 mg/kg body weight. Two animals (one male and one female) were killed one day after treatment. Common signs of systemic toxicity noted were hunched posture, lethargy, ataxia and occasional body tremors with additional signs of laboured respiration, loss of righting reflex and ptosis. Surviving animals appeared normal 3 days after treatment and showed expected gain in body weight during the study.

Abnormalities noted at necropsy of animals killed during the study were abnormally red lungs, patchy pallor of the liver, dark kidneys, haemorrhage of the gastic mucosa and haemorrhage of the small and large intestines. No abnormalities were noted at necropsy of animals killed at the end of the study.

CONCLUSIONS

The test substance has not been classified in this Acute Oral Toxicity Test.

LD50: >5000 mg/kg

DATA QUALITY

Performed to OECD guidelines and to GLP.

REFERENCES

DTBP-Range Finding Acute Oral Toxicity Test in the Rat, Safepharm Laboratories Ltd, P.O. Box No. 45, Derby, DE1 2BT, U.K.

OTHER

Study Ref.: 47/1608

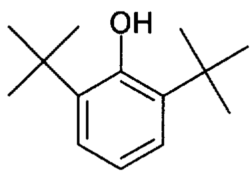
13.3 ACUTE TOXICITY
INHALATION

TEST SUBSTANCE

2,6-Di-*tert* butylphenol

CAS No. 128-39-2

METHOD



Interstate Commerce Commission, Tariff No. 8 Section 73.343 Acute Inhalation Toxicity Test
GLP: (N)
Year study performed: 1955

Species: Rat

Sex: Female

No of animals per sex per dose: 2 females

Vehicle: Air was bubbled through the test substance, maintained at 100°C in an absorption tower, and passed through the 5.82 l chamber at a rate of approximately 515 ml/min. The amount of compound that was carried out of the tower by the flowing air was estimated by weighing the absorption tower containing the compound before starting and after terminating the exposure.

Route of administration: Inhalation – vapour

Remarks: Only one experiment was performed. The animals were exposed to the test material for 3 hours.

RESULTS

No more than traces of the test substance were carried into the chamber by the flowing air and these failed to cause any signs of illness in the rats.

CONCLUSIONS

The vapour pressure of the test substance was not sufficiently high to provide a toxic or lethal concentration within the atmosphere of the respiratory chamber under the conditions (duration of exposure) of the experiment.

Information in this test report may not be acceptable due to deficiency of data element. However, this test is included for valuable comparison and overall evaluation of toxicity of the test material.

DATA QUALITY

Not conducted to GLP.

REFERENCES

The Immediate Toxicity of 2,6-Diisopropylphenol and 2,6-Di-tertiary Butyl Phenol, in Relation to the Regulations of the Interstate Commerce Commission for the Transport of Chemicals. Kettering Laboratory in the Department of Preventative Medicine & Industrial Health, College of Medicine, University of Cincinnati, Cincinnati, Ohio, U.S.A.

OTHER

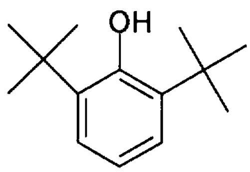
Study Ref: 42096 B3-8

13.4 ACUTE TOXICITY
DERMAL

TEST SUBSTANCE

2,6-Di-*tert* butylphenol

CAS No. 128-39-2



METHOD

No data available
GLP: No data
Year study performed: No data

Species/strain: rat

Route of administration: dermal

RESULTS

Dermal LD50 for rats estimated as greater than 1000 mg/kg and less then 32000 mg/kg.

The given LD50 is according to information submitted under TSCA Section 8(d) by Ethyl Corporation.

CONCLUSIONS

LD50 >1000 mg/kg and <32000 mg/kg

DATA QUALITY

Data taken from a published paper

REFERENCES

Secondary reference:

OECD/SIDS. Screening information Data Set (SIDS) of OECD High Production Volume Chemicals Programme, (1994)

OTHER

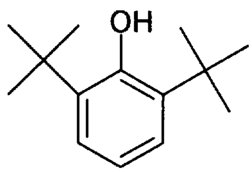
Study Ref: IRPTC Data Profile

13.5 ACUTE TOXICITY
SKIN IRRITATION

TEST SUBSTANCE

2,6-Di-*tert* butylphenol

CAS No. 128-39-2



METHOD

OECD Guidelines No. 404
GLP: (Y)
Year study performed: 1991

Species: New Zealand White rabbits

Sex: Males and females

No of animals per sex per dose: One male and two females

Vehicle: 0.5 g of the test material was ground and moistened with 0.5 ml of distilled water immediately before application.

Remarks: A group of three rabbits were given a single 4-hour, semi-occluded application of the test material to the intact skin. The animals were observed for fourteen days after the day of the dosing.

RESULTS

One animal was killed for humane reasons nine days after patch removal due to illness.

Very slight to well-defined erythema was noted at all treated skin sites one hour after patch removal, with well-defined erythema at all treated skin sites after the 24, 48 and 72-hour observation. Other adverse skin reaction noted at one treated skin site at that time were haemorrhage of dermal capillaries, light brown discolouration of the epidermis, thickening of the skin and loss of skin elasticity. Crust formation was noted at the 7-day observation. Hardened light brown-coloured scabs and thickening of the skin were noted at two treated skin sites at the 7-day observation. These reactions prevented accurate evaluation of erythema and oedema. Crust formation and/or reduced re-growth of fur were noted at two treated skin sites at the 14-day observation. Very slight to moderate oedema was noted at all treated skin sites one and 24 hours after patch removal with very slight to slight oedema at the 48 and 72-hour observations.

CONCLUSIONS

The test material produced a primary irritation index of 3.8 and was classified as a moderate irritant to rabbit skin according to the Draize classification scheme. The test material produced positive criteria in 3/3 rabbits according to the EEC labelling regulations and was classified as irritant to rabbit skin. The symbol Xi and the risk phrase R38 "Irritating to skin" are therefore required.

DATA QUALITY

Study conducted to GLP and OECD guidelines.

REFERENCES

DTBP-Acute Dermal Irritation Test in the Rabbit, Safepharm Laboratories Ltd, P.O. Box No. 45, Derby, DE1 2BT, U.K.

OTHER

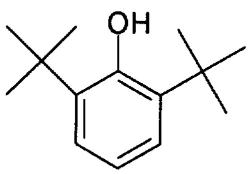
Study Ref: 47/1609

14.1 GENETIC TOXICOLOGY IN VIVO

TEST SUBSTANCE

2,6-Di-*tert* butylphenol

CAS No. 128-39-2



METHOD

Guidelines followed: Protocol-SOP ETTOX 029 with modifications of the method as described by Williams (1978)	
Type: Rat hepatocyte primary culture/DNA repair test	
GLP: (Y)	
Year: 1984	

Species: Fischer-344 rats

Sex: Male

Weight at initiation: 150-300 grams (adult rats)

The rats were anaesthetised with sodium numbutal by intraperitoneal injection. Following anesthetization, the livers were perfused and removed. The livers were excised and the hepatocytes harvested.

Freshly isolated rat hepatocytes were treated with 20 µl of test substance at 0.05, 0.1, 0.5, 1, 5, 10, 50, 100, 500 and 1000 µg/well in 2 ml of media. The hepatocytes were then fixed onto microscope coverslides, stained, dipped and developed.

Negative and positive controls were also included in the experimental design.

Unscheduled DNA repair synthesis was quantified by a net increase of black silver grains in the nucleus for 25 cell/slide. This value was determined by taking a nuclear count and the average of three adjacent cytoplasmic counts.

RESULTS

Cytotoxicity was produced at concentrations of 50 μg/well and above. The highest dose scored was therefore 10 μg/well. The test substance did not cause an increase in mean net nuclear counts over DMSO (negative control) at any dose level counted. A Chi square analysis was performed to compare treated cells to untreated controls. The number of cells with net nuclear grain counts greater than zero of all scored dose levels of test substance was not statistically significantly increased.

CONCLUSIONS

The test substance was not genetically active in this in vivo assay.

DATA QUALITY

Study conducted to GLP and guidelines.

REFERENCES

Genetic toxicology- Rat hepatocyte primary culture/DNA repair test Report number HPC 022 - #068

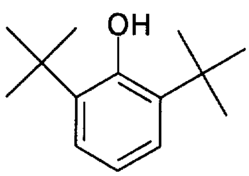
Ethyl Corporation 8000 GSRI Avenue, Baton Rouge, Louisiana 70808, U.S.A.

15.1 GENETIC TOXICITY IN VITRO (GENE MUTATIONS)

TEST SUBSTANCE

2,6-Di-*tert* butylphenol

CAS No. 128-39-2



METHOD

Guideline followed: Ames test
Type: Plate incorporation assay
System of testing: Bacterial
S.O.P. ETTOX-027
GLP: (Y)
Year study performed: 1984

Species/strain: *Salmonella typhimurium*, TA 1535, TA 1537, TA 98 and TA 100.

Metabolic activation: *Salmonella typhimurium* strains were treated in the presence and absence of metabolic activation Aroclor 1254 induced in rat liver S9 fraction with the test substance in acetone.

Concentrations tested: 0, 2.5×10^{-2}, 5×10^{-3}, 2.5×10^{-3}, 5×10^{-4} and 2.5×10^{-4} mg/plate

Remarks: Strains were treated in the presence and absence of metabolic activation with the test substance dissolved in acetone. Each dose was treated in triplicate. An untreated control, solvent control and positive control were treated concurrently.

RESULTS

2.5×10^{-2} mg/plate demonstrated toxicity in strains TA 1535, TA 1537 and TA 100 with and without metabolic activation.
Negative: The test substance did not induce a dose-related increase in mutant colonies over acetone in any strain in the absence or presence of metabolic activation.

CONCLUSIONS

The test material did not cause a dose-related increase in mutant colonies and is not genetically active in the Ames *Salmonella typhimurium* assay.

DATA QUALITY

Study conducted to GLP and OECD guidelines.

REFERENCES

Genetic Toxicity; Salmonella/Microsomal Assay

OTHER

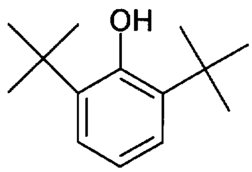
Study Ref: Ames test 086-068 /Ethyl Corporation, 8000 GSRI Avenue, Baton Rouge, Louisiana 70808, U.S.A.

15.2 GENETIC TOXICITY IN VITRO (GENE MUTATIONS)

TEST SUBSTANCE

2,6-Di-*tert* butylphenol

CAS No. 128-39-2



METHODS

Guideline followed: Ames test Type: Reverse mutation assay
System of testing: Bacterial
GLP: No data available
Year study performed: 1985

Species/strain: *Escherichia coli*: WP_2, WP_2 uvrA

Salmonella typhimurium TA 98, TA 100, TA 1535, TA 1537, TA 1538

Metabolic activation: Strains were treated in the presence and absence of metabolic activation by S-9 mix.

Concentrations tested: No data available

RESULTS

The results of the test were negative for mutagenic effects in the presence or absence of metabolic activation.

CONCLUSIONS

The test material is not genetically active in the *Salmonella* and *Escherichia coli* assay.

DATA QUALITY

Study conducted according to guidelines but no data to show if to GLP.

REFERENCES

Primary reference:
Dean et al. Mutation Research, 153(1-2), 57-77, (1985)

Secondary reference:
OECD/SIDS. Screening Information Data Set (SIDS) of OECD High Production Volume Chemicals Programme, (1984)

OTHER

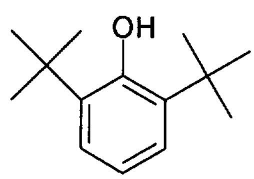
Study ref: IRPTC data profile

15.3 GENETIC TOXICITY IN VITRO (CHROMOSOMAL ABERRATIONS)

TEST SUBSTANCE

2,6-Di-*tert* butylphenol

CAS No. 128-39-2



METHOD

OECD Guideline No 473; EEC Directive 84/449, B 10
Type: Chromosome aberration assay System of testing: Non bacterial
GLP: (Y)
Year study performed: 1992

Species/strain: Chinese hamster V79 cells

Metabolic activation: S-9 mix (with and without)

Exposure period: 18 to 28 hours

Concentrations tested:

Dose/concentration without S-9 mix:
18 hr - 0.3, 3.0, 6.0, 10.0 μg/ml
28 hr – 6.0 μg/ml

Dose/concentration with S-9 mix:
18 hr – 3.0, 30.0, 50.0 μg/ml

28 hr – 50.0 μg/ml

RESULTS

No mutagenic effects were obtained with or without metabolic activation. The test did not produce chromosomal aberrations.

The test substance negatively affected the plating efficiency of the cells at concentrations higher than 3.0 µg/ml (without S-9 mix) and 30.0 µg/ml (with S-9 mix).

CONCLUSIONS

The test substance is not considered to be mutagenic.

DATA QUALITY

Study conducted to GLP and OECD guidelines.

REFERENCES

Primary reference:

Sandoz Chemical Ltd. Muttenz, Switzerland. Unpublished CCR Report- Sandoz, 243628, (1992)

Secondary reference:

OECD/SIDS. Screening information Data Set (SIDS) of OECD High Production Volume Chemicals Programme, (1994)

OTHER

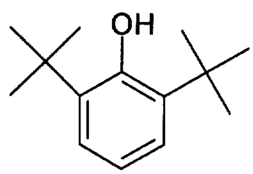
Study Ref: IRPTC Data Profile

15.4 GENETIC TOXICITY IN VITRO (GENE MUTATION ASSAY)

TEST SUBSTANCE

2,6-Di-*tert* butylphenol

CAS No. 128-39-2



METHOD

OECD Guideline No 476; 40 CFR, Ch. I part 798 Type: Mammalian cell gene mutation assay
System of testing: Non bacterial
GLP: (Y)
Year study performed: 1991

Species/strain: Chinese hamster V79 cells

Metabolic activation: S-9 mix (with and without)

Concentrations tested:
Dose/concentration without S-9 mix: 0.3, 1.0, 2.0, 4.0, 6.0 and 8.0 µg/ml
Dose/concentration with S-9 mix: 3.0, 10.0, 20.0, 30.0, 40.0 and 50.0 µg/ml

RESULTS

Up to the highest concentrations of the test substance no relevant increase in mutant colony numbers was obtained in two independent separate experiments. There was no mutagenic effect observed with or without metabolic activation.

CONCLUSIONS

The test substance is not considered to be mutagenic.

DATA QUALITY

Study conducted to GLP and OECD guidelines.

REFERENCES

Primary reference:

Sandoz Chemical Ltd. Muttenz, Switzerland. Unpublished CCR Report- Sandoz, 243617, (1991)

Secondary reference:

OECD/SIDS. Screening information Data Set (SIDS) of OECD High Production Volume Chemicals Programme, (1994)

OTHER

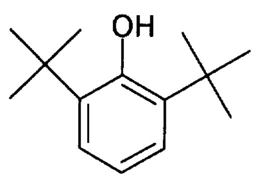
Study Ref: IRPTC Data Profile

16.1 REPEATED DOSE TOXICITY
28 DAYS ORAL

TEST SUBSTANCE

2,6-Di-*tert* butylphenol

CAS No. 128-39-2



METHOD

EEC Directive 84/449/EEC and OECD Guideline No. 407
GLP: No data available
Year study performed: 1992

Species/strain: Rat, Wistar

Sex: Males and females

No of animals per sex per dose: 5 males and 5 females

Route of administration: Oral, gavage

Exposure Period: 28 days

Dose/Concentration: 0, 15, 100 and 600 mg/kg/day

RESULTS

NOAEL 15 mg/kg/day

At the doses of 100 and 600 mg/kg/day, there were decreased levels of serum urea in females only.

Increased relative liver weights were found at 100 mg/kg/day dose level in males only.

At macroscopic examination enlarged caecum was noted in 2 out of 5 males in the dose group of 100 mg/kg/day.

An increased serum total protein level was found in males and females, and increased serum albumin level was found in males at the dose group of 600 mg/kg/day.

Decreased inorganic phosphate and increased calcium levels were noted in the serum of females from the 600 mg/kg/day dose groups.

In the dose group of 600 mg/kg/day enlarged caecum was found in 4/5 males and 5/5 females. In the same dose group enlargement of liver and kidneys were noted. At 600 mg/kg/day increased liver weights were noted in males and females, and increased kidney weights in males only.

At microscopic examination, in the 600 mg/kg/day dose group there was a slight increase of hepatocellular hypertrophy in the centrilobular area in males and females, and eosinophilic inclusions in the renal cortex of males only.

CONCLUSIONS

Concentration of the test substance at which no toxic effects were observed was 15 mg/kg/day under the test conditions.

DATA QUALITY

Study conducted according to OECD guidelines but no data to show if to GLP.

REFERENCES

Primary reference:

Sandoz Chemical Ltd, Muttenz, Switzerland. Unpublished CCR Report- Sandoz, 304435, (1992)

Secondary reference:

OECD/SIDS. Screening information Data Set (SIDS) of OECD High Production Volume Chemicals Programme, (1994)

OTHER

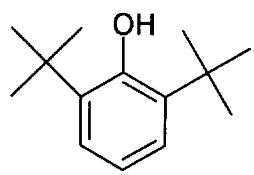
Study Ref: IRPTC Data Profile

17.1 TOXICITY TO REPRODUCTION

TEST SUBSTANCE

2,6-Di-*tert* butylphenol

CAS No. 128-39-2



METHOD

OECD Guideline No. 421 "Preliminary Reproduction/ Developmental Toxicity Screening Test"
GLP: (Y)
Year study performed: 1992

Species/strain: Rats, Wistar

Route of administration: Oral gavage

Dose/concentrations levels: 0, 30, 150 and 750 mg/kg/day

Sex: Males and females

Control group and treatment: 10 males, 10 females per group

Frequency of treatment: 7 days/week

Duration of test: From 2 weeks prior to mating until 4 days post partum (study termination)

Premating exposure period for males: 2 weeks

Premating exposure period for females: 2 weeks

Animals were dosed throughout the premating and mating period (up to 13 days) for all animals. Males received the test substance for a further 43 days and females up to Day 3 post partum.

RESULTS

Marginally reduced body weight gain was observed in male rats from the dose group at 750 mg/kg/day, in spite of increased food consumption. Slight reduction of body weight gains was observed in females of 750 mg/kg/day. Reduced food consumption was observed in these females.

The mutual reproductive parameters (precoital time, percentage mating, fertility index and conception rate) indicated no test substance related effects in any dose group. An increased breeding loss/ reduced viability index was observed for the females of the higher dose group (750 mg/kg/day).

Neither macroscopic examination of the parent animals, nor microscopic examination or mean organ weight and organ/body weight ratios of testes and ovaries, gave any indication of test substance related effects.

Based on these results, the only observed effect was the appearance of severe toxic symptoms in the higher dose group (750 mg/kg/day). With respect to the reproductive and developmental parameters, no effects were noted up to and including 150 mg/kg/day.

NOAEL – Sytemic and reproductive = 150 mg/kg/day

The summary information on the reproductive study for CAS No. 128-39.2 was apparently transcribed from the original report and published in the OECD SIDS. It appears that the transcription was not without possible error(s). The NOAEL provided in the SIDS is stated to be 750 mg/kg/day. However, examination of the summary results suggests this value should be 150 mg/kg/day, based on clinical symptoms, reduced food consumption and reduced body weight gain in the dams at the 750 mg/kg/day dose level.

The NOAEL for developmental toxicity is stated to be 750 mg/kg/day. However, at 750 mg/kg/day a reduction in pup body weight gain was reported in the summary, but not further described as to duration or extent. In addition, the pup viability index (either measured on lactation day 4 or 21) was apparently reduced. For these reasons, and without further study details, it is probably more appropriate to consider this NOAEL as being 150 mg/kg/day and not 750 mg/kg/day as stated in the summary.

CONCLUSIONS

The test substance is not toxic for reproduction in rats.

DATA QUALITY

The study was conducted to GLP and OECD guidelines

REFERENCES

Primary reference:

Sandoz Chemical Ltd. Muttenz, Switzerland. Unpublished CCR Report- Sandoz, 321794, (1992)

Secondary reference:

OECD/SIDS. Screening information Data Set (SIDS) of OECD High Production Volume Chemicals Programme, (1994)

OTHER

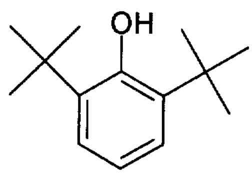
Study Ref : IRPTC Data Profile

18.1 DEVELOPMENTAL TOXICITY/TERATOGENICITY

TEST SUBSTANCE

2,6-Di-*tert* butylphenol

CAS No. 128-39-2



METHOD

OECD Guideline No. 421 "Preliminary Reproduction/ Developmental Toxicity Test"
GLP: (Y)
Year study performed: 1992

Species/strain: Rat, Wistar

Route of administration: Oral, gavage

Dose/concentration: 0, 30, 150 and 750 mg/kg/day were tested.

Sex: Males and females

Control group and treatment: 10 males, 10 females per group

Frequency of treatment: 7 days/ week

Duration of test: Treatment from 2 weeks prior to mating until 4 days post partum (study termination)

Organs examined at necropsy (macroscopic and microscopic): Data not available

RESULTS

NOAEL maternal toxicity 750 mg/kg/day

NOEL developmental toxicity >750 mg/kg/day

Maternal data:
The only observed effect was the appearance of severe toxic symptoms in the higher dose group (750

mg/kg/day). With respect to the reproductive and developmental parameters, no effects were noted up to and including 750 mg/kg/day.

Neither macroscopic examination of the parent animals, nor microscopic examination or mean organ weight and organ/body weight ratios of testes and ovaries, gave any indication of test substance related effects.

Fetal data:
At 750 mg/kg/day maternal exposure dose level the body weight gain of pups was reduced. Other than reduced body weight gain, no test substance related effects on the pups were noted in any dose group.

CONCLUSIONS

The test substance did not cause any reproductive/developmental effects in Wistar rats.

DATA QUALITY

Study conducted to GLP and OECD guidelines

REFERENCES

Primary reference:
Sandoz Chemical Ltd. Muttenz, Switzerland. Unpublished CCR Report-Sandoz, 321794, (1992)

Secondary reference:
OECD/SIDS. Screening information Data Set (SIDS) of OECD High Production Volume Chemicals Programme, (1994)

OTHER

Study Ref: IRPTC Data Profile

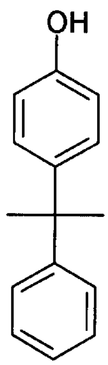
PHYSICAL/CHEMICAL ELEMENTS

1.1 MELTING POINT

TEST SUBSTANCE

p-(*alpha, alpha*-Dimethylbenzyl)phenol

CAS No. 599-64-4



METHOD

Method/guideline followed: Schenectady International Inc. internal procedure.

GLP (Y/N): no.

Year study performed: 1992.

RESULTS

Freeze point: 72°C.

CONCLUSIONS

The freezing point of the test substance is 72°C.

DATA QUALITY

Not a GLP study.

Information taken from technical datasheet.

Purity given as 99% minimum.

REFERENCES

Schenectady International Inc. Technical datasheet (6/92).

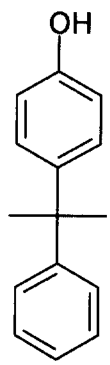
OTHER

2.1 BOILING POINT

TEST SUBSTANCE

p-(*alpha*, *alpha*-Dimethylbenzyl)phenol

CAS No. 599-64-4



METHOD

Method/guideline followed: Schenectady International Inc. internal procedure.

GLP (Y/N): no.

Year study performed: 1992.

RESULTS

Boiling point: 335°C at 760 mm Hg.

CONCLUSIONS

The boiling point of the test substance is 335°C at 760 mm Hg.

DATA QUALITY

Not a GLP study.

Information taken from technical datasheet.

Decomposition: information not available.

Purity given as 99% minimum.

REFERENCES

Schenectady International Inc. Technical datasheet (6/92)

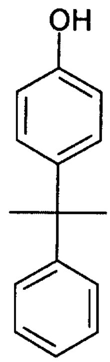
OTHER

3.1 VAPOUR PRESSURE

TEST SUBSTANCE

p-(*alpha*, *alpha*-Dimethylbenzyl)phenol

CAS No. 599-64-4



METHOD

Method/guideline followed: calculation.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Vapour pressure: 2.28 $\times 10^{-5}$ mm Hg at 25°C (0.0030 Pa).

CONCLUSIONS

The calculated vapour pressure is 2.28 $\times 10^{-5}$ mm Hg at 25°C.

DATA QUALITY

Calculation.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. MPBWIN v 1.30.

OTHER

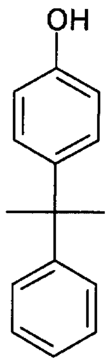
Modified Grain Method used.

4.1 PARTITION COEFFICIENT

TEST SUBSTANCE

p-(*alpha, alpha*-Dimethylbenzyl)phenol

CAS No. 599-64-4



METHOD

Method/guideline followed: calculation.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Log Kow: 4.12.

CONCLUSIONS

The log Kow of the test substance is 4.12.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. KOWWIN v 1.63.

OTHER

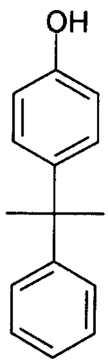
Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 (Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994).

5.1 WATER SOLUBILITY

TEST SUBSTANCE

p-(*alpha, alpha*-Dimethylbenzyl)phenol

CAS No. 599-64-4



METHOD

Method/guideline followed: calculation method using a log Kow of 4.12.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Water solubility: 43.27 mg/l at 25°C.

CONCLUSIONS

The calculated water solubility is 43.27 mg/l at 25°C.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. WSKOW v 1.33.

OTHER

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 (Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994).

The log Kow value obtained using the programme KOWWIN was used in the calculation of water solubility (see 4.1).

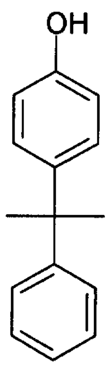
ENVIRONMENTAL FATE AND PATHWAY ELEMENTS

6.1 PHOTODEGRADATION

TEST SUBSTANCE

p-(*alpha, alpha*-Dimethylbenzyl)phenol

CAS No. 599-64-4



METHOD

Method/guideline followed: calculation using the programme AOPWIN v1.88.

Test type: calculation of the rate constant for the atmospheric reaction between photochemically produced hydroxyl radicals and the test substance in the vapour phase.

GLP (Y/N): no.

Year study performed: calculation made for this HPV submission.

RESULTS

Sensitizer: hydroxyl radical.

Overall hydroxyl rate constant: 44.8×10^{-12} cm^3/molecule-sec.

Half-life: 2.87 hours.

CONCLUSIONS

The programme estimates that in a typical atmosphere 50% of the test substance will undergo reaction in 2.87 hours.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. AOPWIN v 1.88.

OTHER

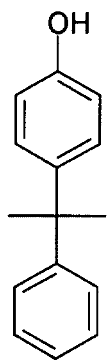
No experimental data was found on direct aqueous photolysis of the test substance. However, *p*-cresol, a related substance, in aqueous solution is reported as having a half-life of 35 days in sunlight (Smith, J.H. et al, "Environmental Pathways of Selected Chemicals in Freshwater Systems: Part II. Laboratory Studies," EPA-600/7-78-074, May 1978. Cited in Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, page 8-38.

7.1 STABILITY IN WATER

TEST SUBSTANCE

p-(*alpha, alpha*-Dimethylbenzyl)phenol

CAS No. 599-64-4



COMMENT

No abiotic hydrolysis studies were located.

The category phenols do not possess any functional groups that are regarded as being susceptible to hydrolysis under environmental conditions (Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, pages 7-4 and 7-5).

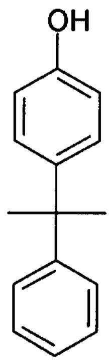
The software prediction programme HYDROWIN v1.66 cannot estimate hydrolysis rate constants for phenols.

8.1 TRANSPORT BETWEEN ENVIRONMENTAL COMPARTMENTS (FUGACITY)

TEST SUBSTANCE

p-(*alpha*, *alpha*-Dimethylbenzyl)phenol

CAS No. 599-64-4



METHOD

Test type: Calculation of partitioning between environmental compartments.

Year study performed: Model run for this HPV submission.

Model: Level 1 Fugacity-Based Environmental Partitioning Model v2.11.

Input values

Chemical specific

Molecular mass:	212
Data temperature (°C):	25
Water solubility (mg/l):	43.27
Vapour pressure (Pa):	0.0030
Log Kow:	4.12
Melting point (°C):	72

Environmental conditions: defaults used.

RESULTS

Environmental compartment	Percentage of test substance
Air	0.023
Soil	90.2
Water	7.72
Suspended sediment	0.063
fish	0.0051
Sediment	2.00

DATA QUALITY

The Mackay Level I Fugacity Model estimates the equilibrium distribution of a fixed quantity of a non-reacting chemical in a closed environment at equilibrium; with no degradation reactions and no flow or intermedia transport processes. The chemical is assumed to distribute instantaneously to an equilibrium concentration and therefore the medium receiving the emission is unimportant. This model is an aid to understanding the physical chemistry properties that are of greatest importance in determining the environmental distribution of substances; it is not a tool to predict actual or likely concentrations in a real environment.

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 and therefore their physical chemistry properties are unlikely to be affected by the pH values normally found in the environment.

REFERENCES

This software program is available with the publication: Mackay, D., Multimedia environmental models: the fugacity approach, Lewis Publishers Inc., Chelsea, MI, 1991.

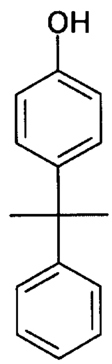
OTHER

9.1 BIODEGRADATION

TEST SUBSTANCE

p-(*alpha, alpha*-Dimethylbenzyl)phenol

CAS No. 599-64-4



METHOD

Method/guideline followed: calculation using the programme BIOWIN v3.65.

Test type: calculation of the probability for rapid aerobic biodegradation of the test substance in the presence of mixed populations of environmental microorganisms.

GLP (Y/N): no.

Year study performed: calculation made for this HPV submission.

RESULTS & CONCLUSIONS

The program predicts:

Primary biodegradation in days/weeks

Ultimate biodegradation in weeks/months.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. BIOWIN v 3.65.

OTHER

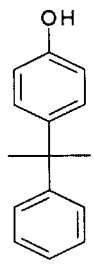
ECOTOXICITY ELEMENTS

10.1 ACUTE TOXICITY TO FISH

TEST SUBSTANCE

p- (*alpha, alpha*-Dimethylbenzyl) phenol

CAS No. 599-64-4



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Fish

Exposure period: 96 hours, 30 days and 90 days

RESULTS

LC50 (96hr) 1.54 mg/l

ChV(30 day) 0.22mg/l

ChV (90 day) 0.029 mg/l

Remark: log Kow used 4.12 (calculated value)

CONCLUSIONS

Estimated LC50 (96hr) for the test substance was found to be 1.54 mg/l.

DATA QUALITY

Estimated

REFERENCES

ECOSAR v.0.99e

OTHER

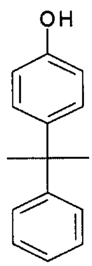
Calculation performed for this HPV submission.

11.1 TOXICITY TO AQUATIC PLANTS (E.G., ALGAE)

TEST SUBSTANCE

p- (*alpha, alpha*- Dimethylbenzyl) phenol

CAS No. 599-64-4



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Green algae

Exposure period: 96 hours

RESULTS

EC50 (96hr) 1.40 mg/l

ChV (96hr) 0.48 mg/l

Remark: log Kow used 4.12 (calculated value)

CONCLUSIONS

Estimated EC50 (96hr) for the test substance was found to be 1.40 mg/l.

DATA QUALITY

Estimate

REFERENCES

ECOSAR v.0.99e

OTHER

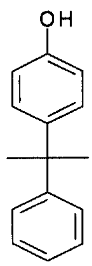
Calculation performed for this HPV submission.

12.1 ACUTE TOXICITY TO AQUATIC INVERTEBRATES (E.G., DAPHNIA)

TEST SUBSTANCE

p- (*alpha, alpha*- Dimethylbenzyl) phenol

CAS No. 599-64-4



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Daphnid

Exposure period: 48 hours, 21 days

RESULTS

LC50 (48hr) 1.6 mg/l

ChV (21day) 0.17 mg/l

Remarks: log Kow used 4.12 (calculated value)

CONCLUSIONS

Estimated LC50 (48hr) for the test substance was found to be 1.6 mg/l.

DATA QUALITY

Estimated

REFERENCES

ECOSAR v. 0.99e

OTHER

Calculation performed for this HPV submission.

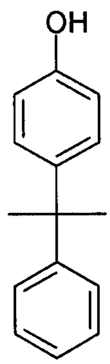
HEALTH ELEMENTS

13.1 ACUTE TOXICITY
ORAL

TEST SUBSTANCE

p-(*alpha, alpha*-Dimethylbenzyl)phenol

CAS No. 599-64-4



METHOD

EPA TSCA 40 CFR 798.1175
GLP: (Y)
Year study performed: 1990

Species: Sprague-Dawley rats, young adult

Sex: Males and females

No of animals per sex per dose: Five groups of male and female rats

Vehicle: The test material was prepared as a 25% w/v formulation in corn oil

Route of administration: Oral

Remarks: Four dose levels were evaluated: 5.0, 2.5, 1.25 and 0.625 g/kg. Animals were observed for 14 days.

RESULTS

The acute oral median dose (LD50) of the test material, in the Sprague-Dawley strain was estimated to be 1.77 g/kg.

Number of deaths at each dose level:

At the dose level of 5.0 g/kg four deaths (100%), were noted between days one and two of the observation period.

At the dose level of 2.5 g/kg four deaths (100%), were noted between days one and five of the observation period.

At the dose level of 1.25 g/kg no deaths (0%), were noted during the observation period.

At the dose level of 0.625 g/kg no deaths (0%), were noted during the observation period.

CONCLUSIONS

The test material is classified in Toxicity Category III (greater than 500 mg/kg thru 5000 mg/kg) by oral administration.

DATA QUALITY

Study conducted to EPA guidelines and GLP.

REFERENCES

Study conducted by Hill Top Biolabs Inc.

OTHER

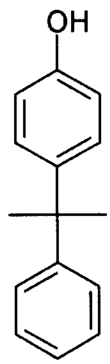
Unpublished study report for Schenectady International, Inc. Schenectady, NY "Acute Oral Toxicity in Rats- p-cumylphenol- Median Lethal Dosage Determination. August 23, 1990".

15.1 GENETIC TOXICITY IN VITRO (GENE MUTATIONS)

TEST SUBSTANCE

p-(*alpha, alpha*-Dimethylbenzyl)phenol

CAS No. 599-64-4



METHOD

Type: The *Salmonella* Reverse Mutation Assay
GLP: Not known
Year study performed: 1984

Species/strain: *Salmonella typhimurium* TA 98, TA 100, TA 1535 and TA 1537

Metabolic activation: S9 fraction from male SD strain rats

Concentrations tested: 5, 10, 50, 100 and 500 µg/plate

RESULTS

>100 µg/plate demonstrated cytotoxicity in strains with metabolic activation.
>50 µg/plate demonstrated cytotoxicity in strains without metabolic activation.

The results of the test were negative for mutagenic effects in the presence or absence of metabolic activation.

CONCLUSIONS

The test substance is not genetically active in The *Salmonella* Reverse Mutation Assay.

DATA QUALITY

Not to GLP

REFERENCES

Report on Mutagenicity test using microorganisms

OTHER

Unpublished study report performed by Mitsui Petrochemical Industries for General Electric Company; December 12, 1984. No further information available.

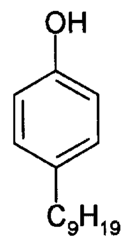
PHYSICAL/CHEMICAL ELEMENTS

1.1 MELTING POINT

TEST SUBSTANCE

p-Nonylphenol

CAS No. 84852-15-3



METHOD

Method/guideline followed: based on USEPA TSCA Environmental Fate Test Guidelines (USEPA 1985). Measurement of Crystallization Point.

GLP (Y/N): yes.

Year study performed: 1990.

RESULTS

Crystallization point: 24.5°C

CONCLUSIONS

The test substance has a crystallization point of 24.5°C.

DATA QUALITY

GLP study.

Information taken from IUCLID database.

Purity of the test substance given as > 95% p-nonylphenol, confirmed by subsequent gas chromatography analysis.

REFERENCES

Alkylphenol and Ethoxylates Panel (1990). Five physical/chemical 4-nonylphenol final reports. 1. boiling point. 2. crystallization point (instead of melting point. 3. dissociation constant. 4. water solubility. 5. vapour pressure. Chemical Manufacturers Association, Washington DC, 20037, August 21, 1990 as cited in IUCLID database.

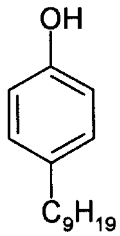
OTHER

2.1 BOILING POINT

TEST SUBSTANCE

p-Nonylphenol

CAS No. 84852-15-3



METHOD

Method/guideline followed: USEPA (1989, 40 CFR 796.1220) with modifications for the high temperatures required.

GLP (Y/N): yes.

Year study performed: 1990.

RESULTS

Three initial trials were run. In all cases the test substance decomposed before the boiling point was reached at temperatures ranging from 215 to 233 (mean 230) °C. In a subsequent trial, decomposition of the test material was observed at temperatures ranging from 283 to 295°C. The boiling point was reported as being greater than 300 °C. However, data from this study indicate that the test substance will thermally decompose before boiling.

CONCLUSIONS

The test substance decomposes before the boiling is reached.

DATA QUALITY

GLP study.

Information taken from IUCLID database.

Purity of the test substance given as > 95% p-nonylphenol, confirmed by subsequent gas chromatography analysis.

REFERENCES

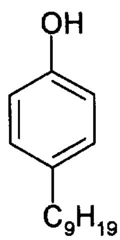
Alkylphenol and Ethoxylates Panel (1990). Five physical/chemical 4-nonylphenol final reports. 1. boiling point. 2. crystallization point (instead of melting point. 3. dissociation constant. 4. water solubility. 5. vapour pressure. Chemical Manufacturers Association, Washington DC, 20037, August 21, 1990 as cited in IUCLID database.

2.2 BOILING POINT

TEST SUBSTANCE

p-Nonylphenol

CAS No. 84852-15-3



METHOD

Method/guideline followed: Schenectady International Inc. internal procedure.

GLP (Y/N): no.

Year study performed: 1992.

RESULTS

Boiling point: 310°C @ 760 mm Hg.

CONCLUSIONS

The test substance has a boiling point of 310°C @ 760 mm Hg.

DATA QUALITY

Not a GLP study.

Information taken from technical datasheet.

Decomposition: information not available.

Purity of the test substance given as typically 95.0% minimum.

REFERENCES

Schenectady International Inc. Technical Datasheet (7/92).

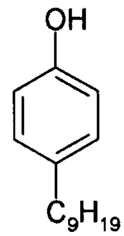
OTHER

3.1 VAPOUR PRESSURE

TEST SUBSTANCE

p-Nonylphenol

CAS No. 84852-15-3



METHOD

Method/guideline followed: USEPA 40 CFR 795.1950 – Gas saturation apparatus method

GLP (Y/N): yes.

Year study performed: 1990.

RESULTS

Vapour pressure: ca. 0.00455 Pa @ 25°C.

CONCLUSIONS

The test substance has a vapour pressure of ca. 0.00455 Pa @ 25°C.

DATA QUALITY

GLP study.

Information taken from IUCLID database.

Decomposition: information not available.

Purity of the test substance given as > 95% *p*-nonylphenol, confirmed by subsequent gas chromatography analysis.

REFERENCES

Alkylphenol and Ethoxylates Panel (1990). Five physical/chemical 4-nonylphenol final reports. 1. boiling point. 2. crystallization point (instead of melting point. 3. dissociation constant. 4. water solubility. 5. vapour pressure. Chemical Manufacturers Association, Washington DC, 20037, August 21, 1990 as cited in IUCLID database.

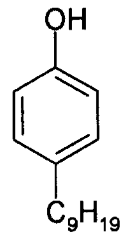
OTHER

4.1 PARTITION COEFFICIENT

TEST SUBSTANCE

p-Nonylphenol

CAS No. 84852-15-3



METHOD

Method/guideline followed: the octanol-water partition coefficient (Kow) of nonylphenol was determined at two concentrations in accordance with USEPA guidelines. test vessels (25 ml Teflon centrifuge tubes) contained 18 ml of pH buffer, 1.9 ml of n-octanol and 100 µl of a stock solution of 4-nonylphenol in n-octanol. Test vessels were agitated for one hour at 25°C and centrifuged at 10000 g for 30 minutes. The test substance was quantified in samples of octanol and water from each vessel by HPLC. The test substance was below the detection limit (32.5 µg/l) in all water samples. Therefore, Kow values were reported as "greater than" values.

GLP (Y/N): yes.

Year study performed: 1990.

RESULTS

Log Kow 3.8 – 4.77 @ 25°C

The data showed concentration dependence because the test substance was non-detectable in all water samples and the value < 32.5 µg/l was used to calculate Kow.

CONCLUSIONS

The test substance has a log Kow of 3.8 – 4.77 @ 25°C.

DATA QUALITY

GLP study.

Purity of the test substance given as > 95% *p*-nonylphenol, confirmed by subsequent gas chromatography analysis.

Method of analysis was insufficiently sensitive to detect analyte in the aqueous phase. The results therefore probably underestimate the value of log Kow.

REFERENCES

Chemical Manufacturers Association (1991). Determination of the Octanol/Water Partition Coefficient of 4-Nonylphenol. Testing laboratory: RF Waston Inc. Lionville, PA. Study no. 90-046. Test sponsor: Chemical Manufacturers Association, Washington DC. December 1991.

OTHER

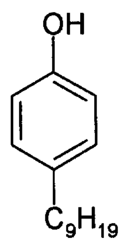
Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 (Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994).

4.2 PARTITION COEFFICIENT

TEST SUBSTANCE

p-Nonylphenol

CAS No. 84852-15-3



METHOD

Method/guideline followed: OECD Guide-line 107 "Partition Coefficient (n-octanol/water), Flask-shaking method.

GLP (Y/N): no.

Year study performed: 1989.

RESULTS

Log Kow: 3.28 @ 20°C.

CONCLUSIONS

The test substance has a log Kow 3.28 @ 20°C.

DATA QUALITY

Not a GLP study.

Information taken from IUCLID database.

The flask-shaking method is an acceptable technique for determining partition coefficients.

Purity of the test substance: information not available in database.

REFERENCES

Huels study 1989 (unpublished). Cited in IUCLID database.

OTHER

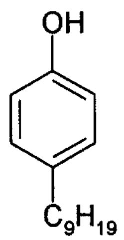
Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 (Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994).

5.1 WATER SOLUBILITY

TEST SUBSTANCE

p-Nonylphenol

CAS No. 84852-15-3



METHOD

Method/guideline followed: USEPA TSCA Environmental Fate Test Guidelines

GLP (Y/N): yes.

Year study performed: 1990.

RESULTS

Water solubility: 3.93 mg/l @ 25°C.

Remarks: The seawater solubility value was calculated as the mean dissolved 4-nonylphenol concentration in the three test samples following HPLC analysis of artificial seawater flowing over a column packed with nonylphenol. The solubility of 4-nonylphenol in the artificial seawater was determined to be 3.93 mg/l (standard deviation 0.38 mg/l, %RSD 10.5)

CONCLUSIONS

The solubility of the test substance in seawater is 3.93 mg/l @ 25°C.

DATA QUALITY

GPL study.

Information taken from IUCLID database.

Purity of the test substance given as > 95% p-nonylphenol, confirmed by subsequent gas chromatography analysis.

REFERENCES

ICI Chemicals & Polymers Limited Runcorn, Cheshire

HUELS AG MARL, 1990 as cited in IUCLID dataset.

OTHER

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 (Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994).

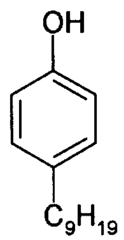
The solubility reported in this robust summary is for seawater therefore a calculated value has also been included (see 5.2).

5.2 WATER SOLUBILITY

TEST SUBSTANCE

p-Nonylphenol

CAS No. 84852-15-3



METHOD

Method/guideline followed: calculation using a log Kow of 5.92.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Water solubility: 1.157 mg/l @ 25°C.

CONCLUSIONS

The test substance has a calculated water solubility of 1.157 mg/l @ 25°C.

DATA QUALITY

Calculation method

REFERENCES

SYRACUSE Chemical Properties Prediction Program. WSKOW v 1.33.

OTHER

Log Kow value of 5.92 used (as calculated by the programme KOWWIN).

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 (Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994).

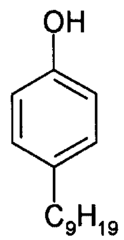
ENVIRONMENTAL FATE AND PATHWAY ELEMENTS

6.1 PHOTODEGRADATION

TEST SUBSTANCE

p-Nonylphenol

CAS No. 84852-15-3



METHOD

Method/guideline followed: calculation using the programme AOPWIN v1.88.

Test type: calculation of the rate constant for the atmospheric reaction between photochemically produced hydroxyl radicals and the test substance in the vapour phase.

GLP (Y/N): no.

Year study performed: calculation made for this HPV submission.

RESULTS

Sensitizer: hydroxyl radical.

Overall hydroxyl rate constant: 51.7×10^{-12} cm^3/molecule-sec.

Half-life: 2.48 hours.

CONCLUSIONS

The programme estimates that in a typical atmosphere 50% of the test substance will undergo reaction in 2.48 hours.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. AOPWIN v 1.88.

OTHER

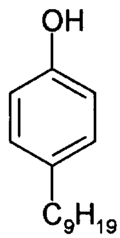
No experimental data was found on direct aqueous photolysis of the test substance. However, *p*-cresol, a related substance, in aqueous solution is reported as having a half-life of 35 days in sunlight (Smith, J.H. et al, "Environmental Pathways of Selected Chemicals in Freshwater Systems: Part II. Laboratory Studies," EPA-600/7-78-074, May 1978. Cited in Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, page 8-38.

7.1 STABILITY IN WATER

TEST SUBSTANCE

p-Nonylphenol

CAS No. 84852-15-3



COMMENT

No abiotic hydrolysis studies were located.

The category phenols do not possess any functional groups that are regarded as being susceptible to hydrolysis under environmental conditions (Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, pages 7-4 and 7-5).

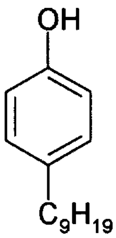
The software prediction programme HYDROWIN v1.66 cannot estimate hydrolysis rate constants for phenols.

8.1 TRANSPORT BETWEEN ENVIRONMENTAL COMPARTMENTS (FUGACITY)

TEST SUBSTANCE

p-Nonylphenol

CAS No. 84852-15-3



METHOD

Test type: Calculation of partitioning between environmental compartments.

Year study performed: Model run for this HPV submission.

Model: Level 1 Fugacity-Based Environmental Partitioning Model v2.11.

Input values

Chemical specific

Molecular mass:	220
Data temperature (°C):	25
Water solubility (mg/l):	3.93
Vapour pressure (Pa):	0.0046
Log Kow:	3.28
Melting point (°C):	24.5

Environmental conditions: defaults used.

RESULTS

Environmental compartment	Percentage of test substance
Air	1.87
Soil	60.7
Water	36.0
suspended sediment	0.042
fish	0.0034
Sediment	1.35

DATA QUALITY

The Mackay Level I Fugacity Model estimates the equilibrium distribution of a fixed quantity of a non-reacting chemical in a closed environment at equilibrium; with no degradation reactions and no flow or intermedia transport processes. The chemical is assumed to distribute instantaneously to an equilibrium concentration and therefore the medium receiving the emission is unimportant. This model is an aid to understanding the physical chemistry properties that are of greatest importance in determining the environmental distribution of substances; it is not a tool to predict actual or likely concentrations in a real environment.

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 and therefore their physical chemistry properties are unlikely to be affected by the pH values normally found in the environment.

REFERENCES

This software program is available with the publication: Mackay, D., Multimedia environmental models: the fugacity approach, Lewis Publishers Inc., Chelsea, MI, 1991.

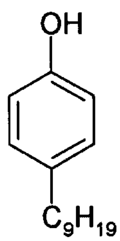
OTHER

9.1 BIODEGRADATION

TEST SUBSTANCE

p-Nonylphenol

CAS No. 84852-15-3



METHOD

Method/guideline followed: ISO Draft "BOD test for insoluble substances".

Test type: aerobic.

GLP (Y/N): no.

Year study performed: 1990.

Contact time: 28 days.

Innoculum: non-adapted, domestic, activated sludge.

Concentration: 34 mg/l.

RESULTS

Percentage degradation: 7% after 28 days.

CONCLUSIONS

p-Nonylphenol was not readily biodegradable under the test conditions.

DATA QUALITY

The reviewer for the IUCLID database considered this study to be valid without restriction and comparable to a guideline study.

REFERENCES

Huels AG: Report no. BO-90/3, 1990 (unpublished), as cited in IUCLID database.

OTHER

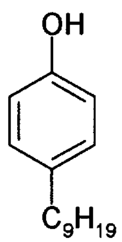
ECOTOXICITY ELEMENTS

10.1 ACUTE TOXICITY TO FISH

TEST SUBSTANCE

p-Nonylphenol

CAS No. 84852-15-3



IUCLID Identification Number: 84852-15-3

Purity of the test substance reported as > 95%, confirmed by subsequent gas chromatography.

p-Nonylphenol was provided by Schenectady Chemical Company.

METHOD

Method: No data
Test type: Flow through, unaerated toxicity test
GLP: (Y)
Year study performed: 1990

Species: *Cyprinodon variegatus*

Analytical monitoring: Yes, details not available on IUCLID

Exposure period: 96 hours

Test conditions: Water quality parameters were within acceptable limits throughout the test.

RESULTS

Nominal concentrations: 0, 0.075, 0.125, 0.19, 0.31 and 0.5 mg/l.

Mean measured concentrations were used for calculations.

LC50 (96hr) 0.31 mg/l

NOEC(96hr) 0.24 mg/l

CONCLUSIONS

The LC50 (96hr) of the test substance is 0.31 mg/l.

DATA QUALITY

GLP study

Information taken from IUCLID database.

REFERENCES

IUCLID Data Sheet

4.1 Acute/Prolonged Toxicity to Fish

Source: ICI Chemicals & Polymers Ltd Runcorn, Cheshire

Huels AG Marl

OTHER

CHRONIC TOXICITY STUDY

IUCLID Data Sheet	Chronic Toxicity to Fish
Substance:	p-Nonylphenol, purity > 95%
Method:	No data
Test type:	flow through, unaerated toxicity test
GLP:	(Y)
Year:	1991
Species:	*Pimephales promelas*
Exposure period:	33 days
Endpoint:	Survival and reproduction rate

Test conditions: Water quality parameters were within acceptable limits throughout the test.

Temperature:	23.4 –26.3°C
Dissolved oxygen:	6.3 – 9.7 mg/l

Results:

Nominal concentrations:	0, 3.0, 6.0, 9.0, 15 and 25 µg/l

Mean measured concentrations were used for all calculations.

NOEC(33days)	7.4 µg/l
LOEC(33days)	14 µg/l
MATC(33days)	10.2 µg/l

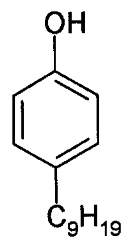
Remarks: The most sensitive measured effect was survival of fathead minnows at the conclusion of the test. Fish exposed to the control and the three lowest tested concentration of Nonylphenol (2.8, 4.5 and 7.4 µg/l) began to hatch on the third day of exposure, while fish exposed to the highest concentrations (14 and 23 µg/l) did not begin to hatch until the fourth day. No statistically significant effects were noted at any test concentration on the number of embryos hatched, the time to first feeding or length and weight of surviving fish. No sublethal effects were noted during the study.

10.2 ACUTE TOXICITY TO FISH

TEST SUBSTANCE

p-Nonylphenol

CAS No. 84852-15-3



IUCLID Identification Number: 84852-15-3

METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Fish

Exposure period: 96 hours, 30 days and 90 days

RESULTS

LC50 (96hr) 0.13 mg/l

ChV(30 day) 0.017 mg/l

ChV (90 day) 0.005 mg/l

Remark: log Kow used 5.92 (calculated value)

CONCLUSIONS

Estimated LC50 (96hr) for the test substance was found to be 0.13 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v.0.99e

OTHER

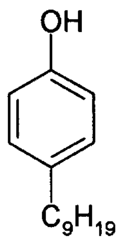
Calculation performed for this HPV submission.

11.1 TOXICITY TO AQUATIC PLANTS (E.G., ALGAE)

TEST SUBSTANCE

p-Nonylphenol

CAS No. 84852-15-3



IUCLID Identification Number: 84852-15-3

Purity of the test substance reported as > 95%, confirmed by subsequent gas chromatography.

p-Nonylphenol was provided by Schenectady Chemical Company.

METHOD

Method: No data
Test type: Static, unaerated toxicity test
GLP: (Y)
Year study performed: 1990

Species: *Selenastrum capricornutum*

Analytical monitoring: Yes, details not available on IUCLID.

Exposure period: 96 hours

Test conditions:

Water quality parameters were within acceptable limits throughout the study. Cell counts were made daily with a haemocytometer.

RESULTS

Nominal concentrations: 0, 0.06, 0.12, 0.25 and 0.5 mg/l.

Mean measured concentrations were used for calculations.

EC50 (96hr) 0.41 mg/l

Remarks: Algae transferred from the test flasks containing the highest test concentration to a flask containing fresh media without Nonylphenol, grew from 9,700 to 1,940,000 cells per ml during the 7 days following the conclusion of the test, indicating a lack of algaestatic effect.

CONCLUSIONS

The EC50 (96hr) of the test substance is 0.41 mg/l.

DATA QUALITY

GLP study

Information taken from IUCLID database.

REFERENCES

IUCLID Data Sheet

4.3 Toxicity to Aquatic Plants e.g. Algae

Source: ICI Chemicals & Polymers Ltd Runcorn, Cheshire

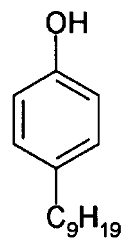
Huels AG Marl

11.2 TOXICITY TO AQUATIC PLANTS (E.G., ALGAE)

TEST SUBSTANCE

p-Nonylphenol

CAS No. 84852-15-3



IUCLID Identification Number: 84852-15-3

METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Green algae

Exposure period: 96 hours

RESULTS

EC50 (96hr) 0.037 mg/l

ChV (96hr) 0.036 mg/l

Remark: log Kow used 5.92 (calculated value)

CONCLUSIONS

Estimated EC50 (96hr) for the test substance was found to be 0.037 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v.0.99e

OTHER

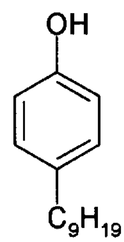
Calculation performed for this HPV submission.

12.1 ACUTE TOXICITY TO AQUATIC INVERTEBRATES (E.G., DAPHNIA)

TEST SUBSTANCE

p-Nonylphenol

CAS No. 84852-15-3



IUCLID Identification Number: 84852-15-3

Purity of the test substance: information not available.

METHOD

Directive 84/449/EEC, C.2 "Acute Toxicity to *Daphnia magna*"
Test type: No data
GLP: (Y)
Year study performed: 1992

Species: *Daphnia magna (Crustacea)*

Analytical monitoring: No

Exposure period: 48 hours

Test conditions: Solvent (acetone)

RESULTS

EC0 (48hr) < 100 µg/l

EC50 (48hr) 140 µg/l

EC100 (48hr) ≥ 400 µg/l

CONCLUSIONS

The EC50 (48hr) of the test substance is 140 µg/l.

DATA QUALITY

GLP study

Information taken from IUCLID database.

Purity of the test substance: information not available.

REFERENCES

IUCLID Data Sheet-

4.2 Acute Toxicity to Aquatic Invertebrates

Source: ICI Chemicals & Polymers Ltd, Runcorn, Cheshire

Huels AG Marl

OTHER

DAPHNIA REPRODUCTION STUDY

IUCLID Data Sheet- *Daphnia* Reproduction Test

Substance: p-Nonylphenol

Method: OECD Guideline No. 202, Part 2 "Daphnia sp. Reproduction Test"

Test type: semi-static

GLP: (Y)

Species: *Daphnia magna (Crustacea)*

Exposure period: 21 day

Endpoint: reproduction rate

Test conditions:

Temperature: 20 ±1°C

10 replicate vessels, each containing one *Daphnia* were employed for the control, solvent control and each test concentration. The *Daphnia* were fed daily with cultures of algae and yeast.

Results:

LC50 values with their 95% confidence limits:

LC50 (1day)	0.18 mg/l (0.13 – 0.25 mg/l)
LC50 (2days)	0.18 mg/l (0.13 – 0.25 mg/l)
LC50 (4days)	0.15 mg/l (0.11 – 0.23 mg/l)
LC50 (7days)	0.12 mg/l (0.10 – 0.17 mg/l)
LC50 (14days)	0.12 mg/l (0.09 – 0.16 mg/l)
LC50 (21days)	0.10 mg/l (0.08 – 0.13 mg/l)

NOEC 0.024 mg/l

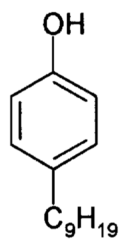
Mean measured concentrations were used for calculations

12.2 ACUTE TOXICITY TO AQUATIC INVERTEBRATES (E.G., DAPHNIA)

TEST SUBSTANCE

p-Nonylphenol

CAS No. 84852-15-3



IUCLID Identification Number: 84852-15-3

METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Daphnid

Exposure period: 48 hours, 21 days

RESULTS

LC50 (48hr) 0.30 mg/l

ChV (21day) 0.014 mg/l

Remark: log Kow used 5.923.28 (calculated value)

CONCLUSIONS

Estimated LC50 (48hr) for the test substance was found to be 0.030 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v. 0.99e

OTHER

Calculation performed for this HPV submission.

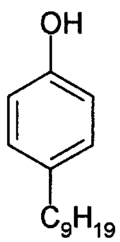
HEALTH ELEMENTS

13.1 ACUTE TOXICITY
ORAL

TEST SUBSTANCE

p-Nonylphenol

CAS No. 84852-15-3



IUCLID Identification Number 84852-15-3

METHOD

OECD Guidelines No. 401
GLP(Y)
Year study performed: 1981

Species: Rat

RESULTS

LD50 =1882 mg/kg

CONCLUSIONS

LD50 =1882 mg/kg

DATA QUALITY

To OECD guidelines and GLP compliant.

Information taken from IUCLID database.

REFERENCES

IUCLID Dataset created by EUROPEAN COMMISSION – European Chemicals Bureau created 19 Feb 2000.

OTHER

On IUCLID there is data available for 20 acute oral toxicity tests that have been done in rats over the years. Several of these studies were performed according to OECD guideline 401 and GLP (as example above).

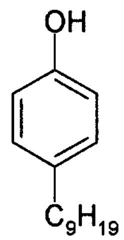
LD50 values were consistently reported to be in the range between 1000 and 2000 mg/kg, with one exception, where a value of 580 mg/kg was reported. However the value of 580 mg/kg relates to an old non-GLP study.

13.2 ACUTE TOXICITY
SENSORY, SKIN AND EYE IRRITATION

TEST SUBSTANCE

p-Nonylphenol

CAS No. 84852-15-3



IUCLID Identification Number: 84852-15-3

SENSORY

REMARK

Acute inhalation studies have not been done to determine an LD50. However assessment of sensory irritation in mice indicates that it is mildly iritating at concentrations of 400ppm.

REFERENCE

IUCLID Dataset created by EUROPEAN COMMISSION – European Chemicals Bureau created 19 Feb 2000

Central Toxicology Laboratory (1995)

Nonylphenol: Assessment of Sensory Irritation potential in mice.

Report Number: CTL/L/6768

Date: 31 August 1996

Study Sponsor: ICI Chemicals & Polymers Limited

SKIN

REMARK

Studies of skin irritation consistently report highly irritating or corrosive properties for nonylphenol. Several of these studies follow current guidelines.

REFERENCE

IUCLID Dataset created by EUROPEAN COMMISSION – European Chemicals Bureau created 19 Feb 2000.

ICI Chemicals & Polymers Limited, Runcorn, Cheshire.

Huels AG Marl

EYE

REMARK

Studies of eye irritation consistently demonstrate the irritation potential of nonylphenol. The only study done to an OECD guideline protocol reports the substance to be irritating.

REFERENCE

IUCLID Dataset created by EUROPEAN COMMISSION – European Chemicals Bureau created 19 Feb 2000.

ICI Chemicals & Polymers Limited Runcorn, Cheshire.

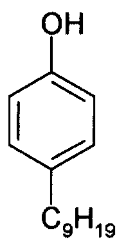
Huels AG Marl

14.1 GENETIC TOXICITY IN VIVO

TEST SUBSTANCE

p-Nonylphenol

CAS No. 84852-15-3



IUCLID Identification Number: 84852-15-3

METHOD

Guideline followed: EEC Directive 79/831, B.12
Type: Micronucleus assay
GLP (N)
Year study performed: 1979

Species/strains: NMRI mice, male and female.

Route of administration: Oral, gavage.

Concentration tested: 500 mg/kg (maximum tolerated dose.)

Monitoring period: 18, 48 and 72 hours.

Nonylphenol was administered once to 10 mice with a dose level of 500 mg/kg.

RESULTS

No mutagenic effects in mouse erythrocytes were observed at any sampling time.

CONCLUSION

The test substance did not demonstrate any mutagenic potential in this in vivo test system.

DATA QUALITY

Study performed to EU guidelines but not GLP.

Information taken from IUCLID database.

REFERENCES

Huels-Report 2 Mutagenitaetsuntersuchung von Nonylphenol im Mikrokern-Test", P. Schoeberl, 1988, (unpublished) as cited in IUCLID.

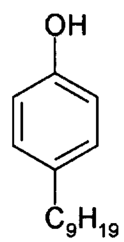
IUCLID Dataset created by EUROPEAN COMMISSION – European Chemicals Bureau created 19 Feb 2000

15.1 GENETIC TOXICITY IN VITRO (GENE MUTATIONS)

TEST SUBSTANCE

p-Nonylphenol

CAS No. 84852-15-3



IUCLID Identification Number: 84852-15-3

METHOD

Guideline followed: Ames test Ames, B.N.: J.McCann, E Yamashi: Mutation Research, 31 347-364, (1975)
Type: Plate incorporation assay
System of testing: Bacterial
GLP (N)
Year study performed: Not known

Species/strains: *Salmonella typhimurium* TA 98, TA 100, TA 1535, TA 1537 and TA 1538.

Concentration tested: Dosed up to 5 mg/plate.

Metabolic activation: Dosed with and without metabolic activation.

RESULTS

Negative in both the presence and absence of metabolic activation.

CONCLUSIONS

The test substance was considered to be non-mutagenic in this test system.

DATA QUALITY

Not conducted to GLP.

Data taken from IUCLID.

REFERENCES

Huels-Report No. 84/19, Project X41, 1984, (unpublished) as cited in IUCLID

ICI Chemicals and Polymers Limited, Runcorn, Cheshire.

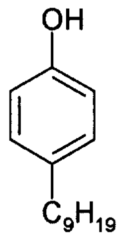
IUCLID Dataset created by EUROPEAN COMMISSION – European Chemicals Bureau created 19 Feb 2000.

15.2 GENETIC TOXICITY IN VITRO (GENE MUTATIONS)

TEST SUBSTANCE

p-Nonylphenol

CAS No. 84852-15-3



IUCLID ID Number: 84852-15-3

METHOD

Guideline followed: OECD Guideline 476 HGPRT assay
Type: V79 cells from Chinese hamster
System of testing: Non bacterial
GLP (Y)
Year study performed: 1984

Species/Strain: V79 cells from Chinese hamster

Metabolic activation: With and without metabolic activation.

Dose range 0.00016 - 0.01 mg/ml without S9 mix and 0.0004 - 0.1 mg/ml with S9 mix.

RESULTS

No reproducible biologically significant increases in mutant frequency at the HPRT locus were observed when compared to the solvent control.

CONCLUSION

The test substance was considered to be non-mutagenic in this test system.

DATA QUALITY

Study was GLP compliant and conducted according to OECD guidelines.

Information taken from IUCLID.

REFERENCE

Huels –Report 688, Final Report: in vitro mammalian cell gene mutation test with nonylphenol, IBR-Project No. 95-86-0446-90, 1990 (unpublished).

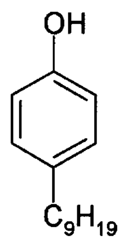
IUCLID Dataset created by EUROPEAN COMMISSION – European Chemicals Bureau created 19 Feb 2000.

16.1 REPEATED DOSE TOXICITY
28 DAY DIET

TEST SUBSTANCE

p-Nonylphenol

CAS No. 84852-15-3



IUCLID ID Number 84852-15-3

METHOD

OECD Guideline 407
GLP (Y)
Year study performed: 1984

Species: Rats

Strain: Crl:CD(SD)BR

Route of Administration: Diet containing Nonylphenol (purity>=98%)

Duration of test: The animals were treated daily for 28 days.

Doses/concentration levels: nominal dose levels of 0, 25, 100 and 400 mg/kg/day

Four groups of ten animals (5 males and 5 females). These are known as groups 1-4 respectively.

RESULTS

NOEL: 100 mg/kg/day.

There were no deaths and no clinical signs to suggest any effect of treatment.

Group 4 animals gained less weight and consumed less food than the controls. At week 4 there were changes in the blood chemistry of animals in group 4, (namely decrease in mean glucose level, increase of mean urea and cholesterol level.) There were increases in group 4 kidney, liver and testes weight. Some other slight histopathological changes seen in the males in group 4 at week 4 included hyaline droplet accumulation in the renal proximal tubules, and minor vacuolation in the periportal hepatocytes in the liver. No such treatment related effects were observed in females.

There were no changes in groups 2 and 3 related to treatment.

CONCLUSION

For both males and females the no observable effect level was considered to be 100 mg/kg/day.

DATA QUALITY

Study conducted according to OECD guidelines and GLP principles.

Information taken from IUCLID.

REFERENCE

Huels-report 774: Nonylphenol: A 28 day oral (dietary) subacute toxicity study in the rat, prepared by Hazleton UK, Report-no. 5917-671/1 (unpublished)

ICI Chemicals and Polymers Limited, Runcorn, Cheshire.

IUCLID Dataset created by EUROPEAN COMMISSION – European Chemicals Bureau created 19 Feb 2000

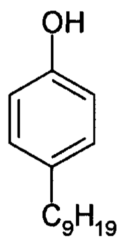
16.2 REPEATED DOSE TOXICITY
90 DAY DIET

TEST SUBSTANCE

p-Nonylphenol

CAS No. 84852-15-3

IUCLID Identification Number 84852-15-3



METHOD

Guideline followed: U.S. EPA TSCA guidelines
Type: Subchronic Toxicity (90-day) study in rats
GLP (Y)
Year study performed: 1997

Species: Sprague-Dawley rats

Strain: Crl:CD BR

Route of administration: Oral diet

Exposure period: 90 days

Four groups of rats were administered dietary concentrations of 0, 200, 650 or 2000 ppm which corresponded to approximate dietary intakes of 0, 15, 50 or 150 mg/kg/day. There were 25 rats/sex/group in the control and high-dose groups and 15 rats/sex/group in the low and mid-dose groups. 10 of the 25 rats/sex in the control and high-dose groups were designated as recovery animals and were maintained on control diets for 4 weeks after completion of the 90-day exposure period to assess the reversibility of any effects, which might be observed. Oestrous cyclicity was monitored during week 8 and sperm count, motility and morphology evaluated at termination to evaluate the possible weak oestrogen-like activity that has been reported for the test substance in a number of screening assays.

RESULTS

NOAEL: 50 mg/kg/day (650 ppm in the diet).

No mortality or morbidityoccurred.

In-life effects from exposure to the test substance were limited to small decreases in body weight (<10%) and food consumption in the 150 mg/kg/day group.

Postmortem measurments at Week 14 indicated a dose-related kidney weight increase in males and a decrease in renal hyaline globules/droplets in males from the high-dose group. The kidney weights showed complete recovery following a 4-week recovery period. The changes were of small magnitude and there were no corresponding clinical or histopathological changes, and thus these findings were not regarded as toxicologically significant.

No other effects attributable to the test substance were observed.

No changes were observed for oestrous cycling, sperm evaluations or effects on endocrine organs.

CONCLUSION

Based on the minor findings for the 150 mg/kg/day dose group, the NOAEL was considered to be 650 ppm in the diet = 50 mg/kg/day.

DATA QUALITY

Conducted according to EPA guidelines and GLP.

REFERENCE

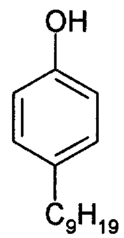
Regulatory Toxicology and Pharmacology Vol. 26, No. 2, pp 172-178 (1997)

17.1 REPRODUCTIVE TOXICITY

TEST SUBSTANCE

p-Nonylphenol

CAS No. 84852-15-3



IUCLID ID Number 84852-15-3

METHOD

Guideline followed: National Institute of Environmental Health Sciences (NIEHS)
Type: Three generation Reproduction study
GLP (Y)
Year study performed: 1997

Species: Sprague-Dawley rats of the Crl:CD BR strain

Route of administration: Oral diet

Doses levels: 0, 200, 650 and 2000 ppm

Number of animals and sex: 30 male and 30 female per group.

Age of animals before initiation of dosing: 7 weeks

Frequency of treatment: Continuous from study day 1 until necropsy/termination

Premating exposure for F_0 generation males and females: 6 weeks

F_1 and F_2 Generations

The dams reared their litters until weaning on Postnatal Day (PND) 21.

At birth pups were sexed, counted and weighed and anogenital distance was measured.

30 pups/sex/group selected for mating trial and 20 pups/sex/group for PND 21 necropsy.

The day of testicular descent, vaginal opening and preputial separation determined.

$F_1$and F_2 animals received diet containing the doses after weaning and at the same dose as their parents.

Generations raised until mating at sexual maturity (PND 86 ±10).

Vaginal smears obtained for three weeks prior to cohabiting.

Cohabiting for up to 14 days, pregnancy confirmed by testing for vaginal sperm.

On completion of lactation phase adults were weighed and necropsied, organ weights obtained, sperm analysis performed and tissues fixed and saved. Tissues preserved were liver, kidneys, spleen, stomach, duodenum, jejunem, ileum, ventral prostate, seminal vesicles with coagulating glands, gross lesions, vagina/cervix, uterus and ovaries or testis and epididymis.

Animals observed twice daily for mortality and signs of toxicity. Body weights, physical examinations and feed consumption obtained every two weeks after weaning.

F_3 Generation

As above until study terminated upon sexual development observations of F_3 generation (PND 55-58).

Statistical methods:

ANOVA and Dunnett's test used to measure tests for homogeneity of variances.

Hypotheses were tested using nonparametric mulitple comparisons procedure of Dunn (1964) or Shirley (1977), as modified by Williams (1986). Also used were Jonckheers's test (1954) and Wilcoxon's test.

Cochran-Armitage test used to test for a dose-related trend, and pairwise comparisons were performed using a chi-square test (Conover, 1971).

Equality of pup weight was evaluated using a parametric analysis of covariance (Nester and Wasserman, 1974).

RESULTS

The overall average estimated dosage during non-reproductive phases for the 200, 650 and 2000 ppm animals varied from 13-19 mg/kg/day, 43-64 mg/kg/day and 131-199 mg/kg/day respectively. The overall estimated dosage during lactation varied from 27-30 mg/kg/day, 93-98 mg/kg/day and 274-322 mg/kg/day respectively.

Maximum tolerated dose was 2000 ppm based on decreased body weight gain and the presence of renal lesions.

Adult body weights of animals dosed at 650 ppm, were reduced in both sexes, at some but not all timepoints. Adult body weights of animals dosed at 2000 ppm animals were reduced in all generations and in both sexes, except F_0 males.

F_0

Although a few clinical signs were observed the incidence of these was low and no dose-related differences were observed.

Fertility was not affected.

No dose related macroscopic or microscopic lesions were seen at in the adults at necropsy.

F_1

PND 21 Necropsy-

Increases in weight of vagina/cervix/uterus in the 650 and 2000 ppm group. Gross lesions noted in one 2000 ppm male and one 2000 ppm male.

Mating trial

Day of vaginal opening accelerated in 650 and 2000 ppm F_1 females. Preputial separation delayed in 2000 ppm F_1 males. No differences in day of testicular descent.

Treatment related decreases in body weight in both male and females were seen at 650 and 2000 ppm.

No dose–related differences in clinical signs were observed: incidences were low to moderate (less than 20% per group).

Continued exposure did not affect the fertility of the F_1 animals, litter size, gestation length, proportion of live born pups, sex ratio, live F_2 pup weight adjusted for litter size, pup survival, anogenital distance, or live pup weights.

Increased length of the estrous cycle and decrease in number of cycles was seen in 2000-ppm F_1 females.

Moribundity was seen in only one 650 ppm F_1 female and this was due to mastitis.

Necropsy Results

Mean terminal body weights and mean absolute weights for the ventral prostrate and right testis of the 2000 ppm F_1 males were decreased. Absolute kidney weights and relative kidney weights were also increased for this group. The mean terminal body weights of the 650 and 2000 ppm F_1 females were also decreased, as were the mean absolute weights of the liver and ovaries. The relative kidney weight was increased for the 2000-ppm F_1 females.

No dose related changes were seen regarding sperm analysis.

No treatment related lesions were noted.

Microscopic evaluation of the kidneys revealed treatment related lesions in the F_1 males and females.

F_2

PND 21 Necropsy

Incidence of gross lesions was very low and no dose response was observed. Relative kidney weights increased by 9% in 2000 ppm group F_2 females.

Mating Trial

The day of vaginal opening was accelerated in 650 and 2000 ppm females and testicular descent was accelerated. No differences were observed in the day of preputial separation.

Treatment related decreases in body weight were observed in the 650 and 2000 ppm males and in the 2000 ppm females.

Mean feed consumption values were decreased in all F_2 males at some time during the study, and some females.

No dose related clinical signs were observed. Incidences were low.

Continued exposure did not affect the fertility of the F_2 animals, litter size, gestation length, proportion of live born pups, sex ratio, live F_3 pup weight adjusted for litter size, pup survival, anogenital distance.

An increase in cycle length was seen in the 2000 ppm F_2 females.

Decreased epididymal sperm density and testicular spermatid head counts were seen in the F_2 generation.

Adult Necropsy results

Some changes in organ weights seen. Ovarian weights were decreased at 650 ppm in F_2 generation and at 2000 ppm in the F_1 F_2 and F_3 generations.

No differences seen in sperm analysis parameters.

Microscopic evaluation of kidneys revealed treatment-related lesions in males and females.

F_3

PND 21 necropsy

F_3 pup terminal body weights were decreased at 650 in males and females. Changes seen in epididymis (relative weight of the right cauda epididymis increased by 24%) and spleen weights (decreased by 24%).

The day of vaginal opening was accelerated in the 650 and 2000 ppm F_3 females. The day of testicular descent was delayed in males. No differences were observed in the day of preputial separation.

F_3 Terminal necropsy

Mean body weights of the 2000 ppm F_3 males decreased. For the 650 and 2000 ppm males the right epididymis were decreased. Testis to terminal body weight ratio increased in 2000 ppm.

Mean body weights of the 650 and 2000 ppm F_3 females decreased. Also decreased were absolute weights of liver, kidneys and vagina/cervix/uterus in the 650 and 2000 ppm females.

No dose related lesions recorded.

Microscopic evaluation of kidneys revealed dose related lesions in males and females.

CONCLUSION

Reproductive changes seen in both males and females at ≥ 650 ppm, although there was no consistent effect on fertility in the F_0, F_1 or F_2 mating trials.

Oestrous cycle was lengthened (2000 ppm) and a clear treatment-related change in the day of vaginal opening was seen in all three generations. The acceleration in vaginal opening was taken as an indication of the estrogenicity of the test substance, and was considered not necessarily adverse in itself.

No changes were noted in the remaining reproductive/developmental parameters including pregnancy index, mating index, proportion of pups born alive, sex ratio, pup weights, anogenital distance and survival.

No clear treatment-related changes were noted in testicular descent, preputial separation or sex ratio.

Decreased epididymal sperm density and testicular spermatid head counts were seen in the F_2 generation. These changes were not linked to alterations in fertility.

NOAEL – Systemic and reproductive toxicity = 200 ppm

DATA QUALITY

Study performed using NIEHS guidelines and to GLP.

REFERENCES

Final report on the reproductive toxicity of nonylphenol administered by gavage to Sprague-Dawley rats.

National Toxicology Program
National institute of Environmental Health Sciences
P.O. Box 12233
Research Triangle Park, NC 27709

OTHER

Toxicokinetic Studies

Weak oestrogenic activity has been reported for p-alkylphenols with relative potencies several orders of magnitude lower than that observed for the physiological hormone 17a-estradiol. Concerns have been raised concerning bioaccumulation in the blood of humans exposed to trace levels of alkylphenols.

Toxicokinetic studies with p-Nonylphenol as a model have been conducted in rats to address these concerns. The results suggest that the test substance does not bioaccumulate in rats receiving low oral doses and only if the detoxification pathways in the liver are saturated by excessive doses does bioaccumulation occur.

Estrogenic Activity

Several assays have been performed using p-nonylphenol in a number of *in vitro* and *in vivo* test systems to help identify oestrogen-like activity.

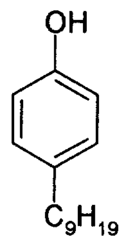
The main conclusions from these studies are that increases in uterine weight were only seen at very high doses compared to the positive control.

18.1 DEVELOPMENTAL TOXICITY/TERATOGENICITY

TEST SUBSTANCE

p-Nonylphenol

CAS No. 84852-15-3



IUCLID ID Number 84852-15-3

METHOD

Guideline followed: EEC directive 87/302, Part B, p.24
Type: "Teratogenicity test-rodent and non-rodent"
GLP (Y)
Year study performed: 1981

Species: Rat

Strain: Wistar

Route of administration: Oral gavage

Doses/Concentrations: 75, 150 and 300 mg/kg/day

Sex: Female

Exposure period: 6-15 day of gestation

Frequency of treatment: Daily

Control group: Yes

Duration of test: 20 days

RESULTS

NOAEL maternal toxicity: 75 mg/kg/day

NOAEL developmental toxicity: 300 mg/kg/day

Treatment of pregnant females from Day 6 to Day 15 of gestation at a dose level of 75 mg/kg was without any general toxicological effect. At a dose level of 150 mg/kg/day 3 of 21 females showed pale and irregularly shaped kidneys, reddening of the renal pelvis and small spleens. 300 mg/kg/day caused clear maternal toxic effects, i.e. increased mortality, reduced body weight gain and food consumption, and kidney and spleen effects. Caesarean sections were carried out on day 20 of gestation. The findings did not disclose any biologically significant differences between groups in the mean number and presentation of the foetuses, the left or right intra-uterine distribution, the sex ratio, foetal and placental weights, the number of runts and dead foetuses, resorptions, implantation and corpora lutea as indices. Foetal examination did not disclose any treatment related malformations or abnormalities. With regard to the embryo-foetal development a no observable adverse effect level of 300 mg/kg/day was found.

CONCLUSION

Test substance did not show teratogenic effects in rats.

DATA QUALITY

The study was performed according to current EU guidelines and to GLP.

Information taken from IUCLID database

REFERENCE

IBR Forschungs GmbH, D-3030 Waldsrobe: IBR-Project-No: 20-04-0502/00-91 (1992)

Sponsor: INITATIVE UMWELTRELEVANTE ALTSTOFFE E.V. Kennedyalle 93, W-6000 Frankfurt 70 as cited in IUCLID database

IUCLID Dataset created by EUROPEAN COMMISSION – European Chemicals Bureau created 19 Feb 2000

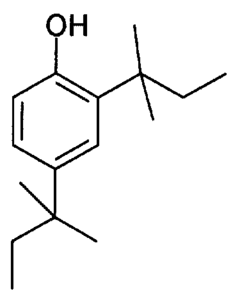
PHYSICAL/CHEMICAL ELEMENTS

1.1 MELTING POINT

TEST SUBSTANCE

2,4-Di-*tert*-pentylphenol

CAS No. 120-95-6



METHOD

Method/guideline followed: information not available in database.

GLP (Y/N): no.

Year study performed: 1932.

RESULTS

Melting point: 26°C.

CONCLUSIONS

The test substance has a melting point of 26°C.

DATA QUALITY

Not a GLP study

Information taken from the results of a literature search covering appropriate databases.

Purity of the substance / decomposition: information not available.

REFERENCES

Dow Chem. Co., US 1972599 1932, Handbook Data

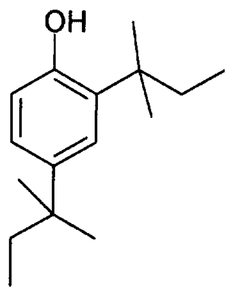
OTHER

2.1 BOILING POINT

TEST SUBSTANCE

2,4-Di-*tert*-pentylphenol

CAS No. 120-95-6



METHOD

Method/guideline followed: calculation.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Boiling point: 310.95°C.

CONCLUSIONS

The test substance has a calculated boiling point of 310.95°C.

DATA QUALITY

Calculation method

REFERENCES

SYRACUSE Chemical Properties Prediction Program. MPBPWIN v 1.30.

OTHER

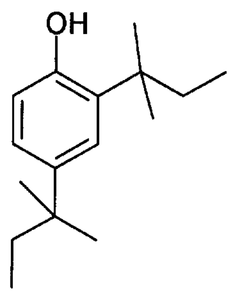
Adapted Stein & Brown method used.

3.1 VAPOUR PRESSURE

TEST SUBSTANCE

2,4-Di-*tert*-pentylphenol

CAS No. 120-95-6



METHOD

Method/guideline followed: calculation.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Vapour pressure: 8.41×10^{-5} mm Hg @ 25°C (0.011 Pa).

CONCLUSIONS

The test substance has a calculated vapour pressure of 8.41×10^{-5} mm Hg @ 25°C.

DATA QUALITY

Calculation method

REFERENCES

SYRACUSE Chemical Properties Prediction Program. MPBPWIN v 1.30

OTHER

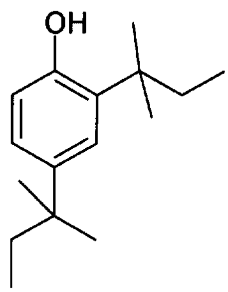
Modified Grain method used.

4.1 PARTITION COEFFICIENT

TEST SUBSTANCE

2,4-Di-*tert*-pentylphenol

CAS No. 120-95-6



METHOD

Method/guideline followed: calculation.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Log Kow: 6.31

CONCLUSIONS

The test substance has a log Kow of 6.31.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. KOWWIN v 1.63

OTHER

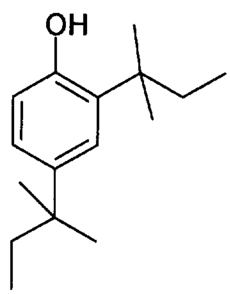
Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 (Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994).

5.1 WATER SOLUBILITY

TEST SUBSTANCE

2,4-Di-*tert*-pentylphenol

CAS No. 120-95-6



METHOD

Method/guideline followed: calculation using a calculated log Kow value of 6.31.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Water solubility: 0.4441 mg/l @ 25°C.

CONCLUSIONS

The test substance has a calculated water solubility of 0.4441 mg/l.

DATA QUALITY

Calculation.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. WSKOW v1.33.

OTHER

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 (Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994).

The log Kow value of 6.31 calculated by the programme KOWWIN (see 4.1) was used in the calculation of water solubility.

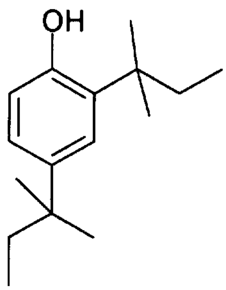
ENVIRONMENTAL FATE AND PATHWAY ELEMENTS

6.1 PHOTODEGRADATION

TEST SUBSTANCE

2,4-di-*tert*-pentylphenol

CAS No. 120-95-6



METHOD

Method/guideline followed: calculation using the programme AOPWIN v1.88.

Test type: calculation of the rate constant for the atmospheric reaction between photochemically produced hydroxyl radicals and the test substance in the vapour phase.

GLP (Y/N): no.

Year study performed: calculation made for this HPV submission.

RESULTS

Sensitizer: hydroxyl radical.

Overall hydroxyl rate constant: 51.4×10^{-12} cm^3/molecule-sec.

Half-life: 2.50 hours.

CONCLUSIONS

The programme estimates that in a typical atmosphere 50% of the test substance will undergo reaction in 2.50 hours.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. AOPWIN v 1.88.

OTHER

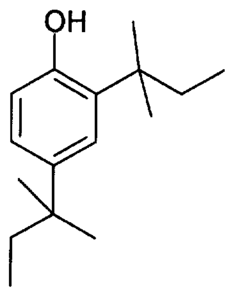
No experimental data was found on direct aqueous photolysis of the test substance. However, *p*-cresol, a related substance, in aqueous solution is reported as having a half-life of 35 days in sunlight (Smith, J.H. et al, "Environmental Pathways of Selected Chemicals in Freshwater Systems: Part II. Laboratory Studies," EPA-600/7-78-074, May 1978. Cited in Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, page 8-38.

7.1 STABILITY IN WATER

TEST SUBSTANCE

2,4-di-*tert*-pentylphenol

CAS No. 120-95-6



COMMENT

No abiotic hydrolysis studies were located.

The category phenols do not possess any functional groups that are regarded as being susceptible to hydrolysis under environmental conditions (Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, pages 7-4 and 7-5).

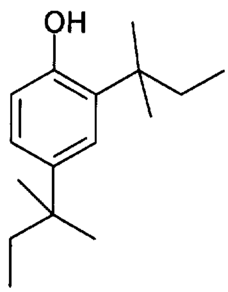
The software prediction programme HYDROWIN v1.66 cannot estimate hydrolysis rate constants for phenols.

8.1 TRANSPORT BETWEEN ENVIRONMENTAL COMPARTMENTS (FUGACITY)

TEST SUBSTANCE

2,4-di-*tert*-pentylphenol

CAS No. 120-95-6



METHOD

Test type: Calculation of partitioning between environmental compartments.

Year study performed: Model run for this HPV submission.

Model: Level 1 Fugacity-Based Environmental Partitioning Model v2.11.

Input values

Chemical specific

Molecular mass:	234
Data temperature (°C):	25
Water solubility (mg/l):	0.4441
Vapour pressure (Pa):	0.011
Log Kow:	6.31
Melting point (°C):	26

Environmental conditions: defaults used.

RESULTS

ENVIRONMENTAL COMPARTMENT	Percentage of test substance
Air	0.063
Soil	97.6
Water	0.054
suspended sediment	0.068
fish	0.0055
Sediment	2.17

DATA QUALITY

The Mackay Level I Fugacity Model estimates the equilibrium distribution of a fixed quantity of a non-reacting chemical in a closed environment at equilibrium; with no degradation reactions and no flow or intermedia transport processes. The chemical is assumed to distribute instantaneously to an equilibrium concentration and therefore the medium receiving the emission is unimportant. This model is an aid to understanding the physical chemistry properties that are of greatest importance in determining the environmental distribution of substances; it is not a tool to predict actual or likely concentrations in a real environment.

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 and therefore their physical chemistry properties are unlikely to be affected by the pH values normally found in the environment.

REFERENCES

This software program is available with the publication: Mackay, D., Multimedia environmental models: the fugacity approach, Lewis Publishers Inc., Chelsea, MI, 1991.

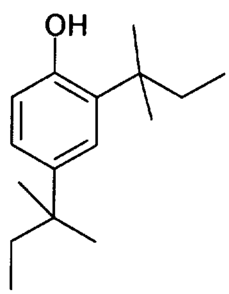
OTHER

9.1 BIODEGRADATION

TEST SUBSTANCE

2,4-di-*tert*-pentylphenol

CAS No. 120-95-6



METHOD

Method/guideline followed: calculation using the programme BIOWIN v3.65.

Test type: calculation of the probability for rapid aerobic biodegradation of the test substance in the presence of mixed populations of environmental microorganisms.

GLP (Y/N): no.

Year study performed: calculation made for this HPV submission.

RESULTS & CONCLUSIONS

The program predicts:

Primary biodegradation in weeks

Ultimate biodegradation in weeks/months.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. BIOWIN v 3.65.

OTHER

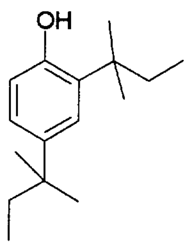
ECOTOXICITY ELEMENTS

10.1 ACUTE TOXICITY TO FISH

TEST SUBSTANCE

2, 4-*di-tert*-Pentylphenol

CAS No. 120-95-6



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Fish

Exposure period: 95hours, 30days, 90 days

RESULTS

LC50 (96hr) 0.076 mg/l

ChV (30day) 0.011 mg/l

ChV (90day) 0.003 mg/l

Remark: log Kow used 6.31 (calculated value)

CONCLUSIONS

Estimated LC50 (96hr) value for the test substance was found to be 0.076 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v 0.99e

OTHER

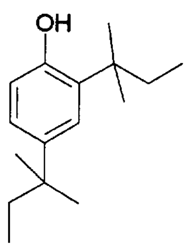
Calculation performed for this HPV submission.

11.1 ACUTE TOXICITY TO ALGAE

TEST SUBSTANCE

2, 4-*di-tert*-Pentylphenol

CAS No. 120-95-6



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e	
GLP: (N)	
Year study performed: 2000	

Species: Green algae

Exposure period: 96 hours

RESULTS

EC50 (96hr) 0.018 mg/l

ChV (96hr) 0.022 mg/l

Remark: log Kow used 6.31 (calculated value)

CONCLUSIONS

Estimated EC50 (96hr) value for the test substance was found to be 0.018 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v 0.99e

OTHER

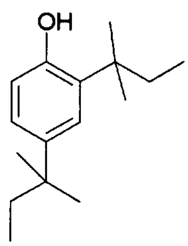
Calculation performed for this HPV submission.

12.1 ACUTE TOXICITY TO AQUATIC INVERTEBRATES (E.G., DAPHNIA)

TEST SUBSTANCE

2, 4-*di-tert*-Pentylphenol

CAS No. 120-95-6



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Daphnid

Exposure period: 48hours, 21 days

RESULTS

LC50 (48hr) 0.22 mg/l

ChV (21day) 0.008 mg/l

Remark: log Kow used 6.31 (calculated value)

CONCLUSIONS

Estimated LC50 (48hr) value for the test substance was found to be 0.22 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v 0.99e

OTHER

Calculation performed for this HPV submission.

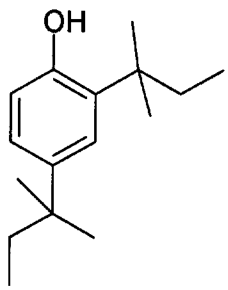
HEALTH ELEMENTS

13.1 ACUTE TOXICITY
ORAL

TEST SUBSTANCE

2,4-di-*tert*-pentylphenol

CAS No. 120-95-6



METHOD

Oral LD50 (Rats, mixed sex). Conducted according to a modification of the method by E.J. de Beer.
GLP: (N)
Year study performed: 1968

Species: Sprague-Dawley CD rats

Sex: Male and female

No of animals per sex per dose: 10 males, 10 females

Vehicle: No information given.

RESULTS

LD50: 920 mg/kg (confidence limits: 800 – 1060 mg/kg)

The substance is classified as mildly toxic by oral ingestion.

Survival time was 1 to 6 days with most deaths occurring in 3 to 4 days. Toxic symptoms included loss of appetite, increasing weakness, salivation, tremors and dysnpea. At autopsy there was liver discolouration, renal congestion and haemorrhagic areas in the lungs.

CONCLUSIONS

LD50: 920 mg/kg

DATA QUALITY

Study not performed to GLP.

REFERENCES

Monsanto Company, 800 N. Lindbergh Boulevard, St Louis, Missouri 63167, U.S.A. Testing performed by Younger Laboratories, Cliff Cave Road, St. Louis, Missouri 68189, U.S.A. project # Y-68-115

OTHER

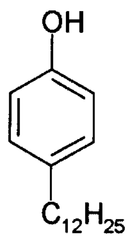
PHYSICAL/CHEMICAL ELEMENTS

1.1 MELTING POINT

TEST SUBSTANCE

p-Dodecylphenol

CAS No. 210555-94-5



METHOD

Method/guideline followed: calculation.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Melting point: 101.68°C.

CONCLUSIONS

The test substance has a calculated melting point of 101.68°C.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. MPBPWIN v 1.30

OTHER

Weighted value used.

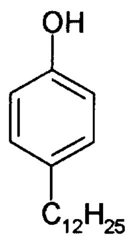
This substance is a mixture of isomers. A representative structure has been used for this calculation.

2.1 BOILING POINT

TEST SUBSTANCE

p-Dodecylphenol

CAS No. 210555-94-5



METHOD

Method/guideline followed: not stated.

GLP (Y/N): no.

Year study performed: not known.

RESULTS

Boiling point: 308°C.

CONCLUSIONS

The test substance has a boiling point of 308°C (atmospheric pressure assumed).

DATA QUALITY

Not a GLP study.

Information taken from a safety datasheet.

Method/purity/decomposition: information not available.

REFERENCES

Schenectady International Inc. Material Safety Datasheet (1/19/99).

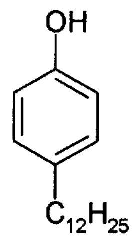
OTHER

3.1 VAPOUR PRESSURE

TEST SUBSTANCE

p-Dodecylphenol

CAS No. 210555-94-5



METHOD

Method/guideline followed: calculation.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Vapour pressure: 2.09 x 10^{-5} mm Hg @ 25°C (0.0028 Pa).

CONCLUSIONS

The test substance has a calculated vapour pressure of 2.09 x 10^{-5} mm Hg @ 25°C.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. MPBPWIN v 1.30.

OTHER

Modified Grain method.

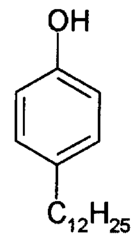
This substance is a mixture of isomers. A representative structure has been used for this calculation.

4.1 PARTITION COEFFICIENT

TEST SUBSTANCE

p-Dodecylphenol

CAS No. 210555-94-5



METHOD

Method/guideline followed: calculation.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Log Kow: 7.17.

CONCLUSIONS

The test substance has a calculated log Kow of 7.17.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. KOWWIN v 1.63.

OTHER

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 (Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994).

This substance is a mixture of isomers. A representative structure has been used for this calculation.

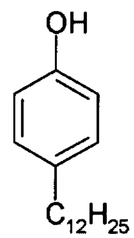
KOWWIN reported an experimental log Kow of 7.91 in its database but this was for a *p*-dodecylphenol with a CAS no. of 104-43-8 (Itokawa et al; 1989).

5.1 WATER SOLUBILITY

TEST SUBSTANCE

p-Dodecylphenol

CAS No. 210555-94-5



METHOD

Method/guideline followed: calculation using a log Kow value of 7.17.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Water solubility: 0.05811 mg/l @ 25°C.

CONCLUSIONS

The test substance has a calculated water solubility of 0.05811 mg/l @ 25°C.

DATA QUALITY

Calculation method

REFERENCES

SYRACUSE Chemical Properties Prediction Program. WSKOW v 1.33.

OTHER

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 (Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994).

This substance is a mixture of isomers. A representative structure has been used for this calculation.

The log Kow value (7.17) calculated using the programme KOWWIN (see 4.1) has been used for the calculation of water solubility.

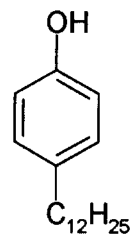
ENVIRONMENTAL FATE AND PATHWAY ELEMENTS

6.1 PHOTODEGRADATION

TEST SUBSTANCE

p-Dodecylphenol

CAS No. 210555-94-5



METHOD

Method/guideline followed: calculation using the programme AOPWIN v1.88.

Test type: calculation of the rate constant for the atmospheric reaction between photochemically produced hydroxyl radicals and the test substance in the vapour phase.

GLP (Y/N): no.

Year study performed: calculation made for this HPV submission.

RESULTS

Sensitizer: hydroxyl radical.

Overall hydroxyl rate constant: 48.4×10^{-12} cm^3/molecule-sec.

Half-life: 2.65 hours.

CONCLUSIONS

The programme estimates that in a typical atmosphere 50% of the test substance will undergo reaction in 2.65 hours.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. AOPWIN v 1.88.

OTHER

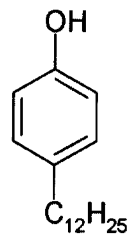
No experimental data was found on direct aqueous photolysis of the test substance. However, *p*-cresol, a related substance, in aqueous solution is reported as having a half-life of 35 days in sunlight (Smith, J.H. et al, "Environmental Pathways of Selected Chemicals in Freshwater Systems: Part II. Laboratory Studies," EPA-600/7-78-074, May 1978. Cited in Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, page 8-38.

7.1 STABILITY IN WATER

TEST SUBSTANCE

p-Dodecylphenol

CAS No. 210555-94-5



COMMENT

No abiotic hydrolysis studies were located.

The category phenols do not possess any functional groups that are regarded as being susceptible to hydrolysis under environmental conditions (Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, pages 7-4 and 7-5).

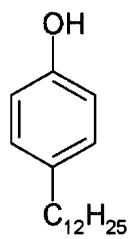
The software prediction programme HYDROWIN v1.66 cannot estimate hydrolysis rate constants for phenols.

8.1 TRANSPORT BETWEEN ENVIRONMENTAL COMPARTMENTS (FUGACITY)

TEST SUBSTANCE

p-Dodecylphenol

CAS No. 210555-94-5



METHOD

Test type: Calculation of partitioning between environmental compartments.

Year study performed: Model run for this HPV submission.

Model: Level 1 Fugacity-Based Environmental Partitioning Model v2.11.

Input values

Chemical specific

Molecular mass:	262
Data temperature (°C):	25
Water solubility (mg/l):	0.05811
Vapour pressure (Pa):	0.0028
Log Kow:	7.17
Melting point (°C):	102

Environmental conditions: defaults used.

RESULTS

Environmental compartment	Percentage of test substance
Air	0.019
Soil	97.7
Water	0.0075
suspended sediment	0.068
fish	0.0055
Sediment	2.17

DATA QUALITY

The Mackay Level I Fugacity Model estimates the equilibrium distribution of a fixed quantity of a non-reacting chemical in a closed environment at equilibrium; with no degradation reactions and no flow or intermedia transport processes. The chemical is assumed to distribute instantaneously to an equilibrium concentration and therefore the medium receiving the emission is unimportant. This model is an aid to understanding the physical chemistry properties that are of greatest importance in determining the environmental distribution of substances; it is not a tool to predict actual or likely concentrations in a real environment.

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 and therefore their physical chemistry properties are unlikely to be affected by the pH values normally found in the environment.

REFERENCES

This software program is available with the publication: Mackay, D., Multimedia environmental models: the fugacity approach, Lewis Publishers Inc., Chelsea, MI, 1991.

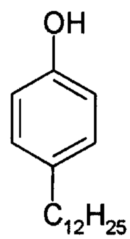
OTHER

9.1 BIODEGRADATION

TEST SUBSTANCE

p-Dodecylphenol

CAS No. 210555-94-5



METHOD

Method/guideline followed: calculation using the programme BIOWIN v3.65.

Test type: calculation of the probability for rapid aerobic biodegradation of the test substance in the presence of mixed populations of environmental microorganisms.

GLP (Y/N): no.

Year study performed: calculation made for this HPV submission.

RESULTS & CONCLUSIONS

The program predicts:

Primary biodegradation in weeks

Ultimate biodegradation in weeks/months.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. BIOWIN v 3.65.

OTHER

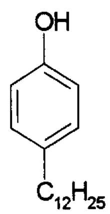
ECOTOXICITY ELEMENTS

10.1 ACUTE TOXICITY TO FISH

TEST SUBSTANCE

p-Dodecylphenol

CAS No. 210555-94-5



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Fish

Exposure period: 96 hours, 30 days and 90 days

RESULTS

LC50 (96hr) 0.025 mg/l

ChV (30 day) 0.003 mg/l

ChV (90 day) 0.00153 mg/l

Remarks: log Kow used 7.17 (calculated value)

CONCLUSIONS

Estimated LC50 (96hr) for the test substance was found to be 0.025 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v.0.99e

OTHER

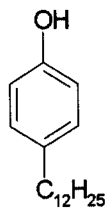
Calculation performed for this HPV submission.

11.1 TOXICITY TO AQUATIC PLANTS (E.G., ALGAE)

TEST SUBSTANCE

p-Dodecylphenol

CAS No. 210555-94-5



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Green algae

Exposure period: 96 hours

RESULTS

EC50 (96hr) 0.003 mg/l

ChV (96hr) 0.007 mg/l

Remark: log Kow used 7.17 (calculated value)

CONCLUSIONS

Estimated EC50 (96hr) for the test substance was found to be 0.003 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v.0.99e

OTHER

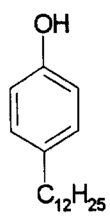
Calculation performed for this HPV submission.

12.1 ACUTE TOXICITY TO AQUATIC INVERTEBRATES (E.G., DAPHNIA)

TEST SUBSTANCE

p-Dodecylphenol

CAS No. 210555-94-5



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Daphnid

Exposure period: 48 hours, 21 days

RESULTS

LC50 (48hr) 0.11 mg/l

ChV (21day) 0.003 mg/l

Remarks: log Kow used 7.17 (calculated value)

CONCLUSIONS

Estimated LC50 (48hr) for the test substance was found to be 0.11 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v. 0.99e

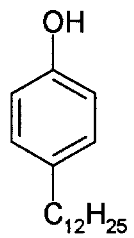
OTHER

Calculation performed for this HPV submission.

HEALTH ELEMENTS

p-Dodecylphenol

CAS No. 210555-94-5



No test reports found

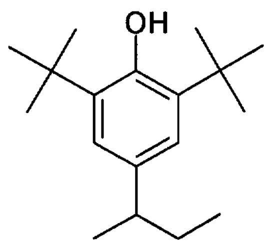
PHYSICAL/CHEMICAL ELEMENTS

1.1 MELTING POINT

TEST SUBSTANCE

4-*sec*-Butyl-2,6-di-*tert*-butylphenol

CAS No. 17540-75-9



METHOD

Method/guideline followed: information not available.

GLP (Y/N): no.

Year study performed: 1960.

RESULTS

Melting point: 47°C.

CONCLUSIONS

The test substance has a melting point of 47°C.

DATA QUALITY

Not a GLP study.

Information taken from the results of a literature search covering appropriate databases.

Information on method, decomposition and purity not available.

REFERENCES

Ingold, J.Phys.Chem., 640 (1960), 1636, 1637. As quoted in a literature search covering appropriate databases.

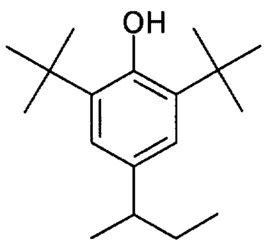
OTHER

2.1 BOILING POINT

TEST SUBSTANCE

4-*sec*-Butyl-2,6-di-*tert*-butylphenol

CAS No. 17540-75-9



METHOD

Method/guideline followed: Schenectady International Inc. internal procedure.

GLP (Y/N): no.

Year study performed: 1993.

RESULTS

Boiling point: 275°C (atmospheric pressure assumed).

CONCLUSIONS

The test substance has a boiling point of 275°C.

DATA QUALITY

Not a GLP study.

Information taken from a technical datasheet.

Decomposition: information not available.

Purity of the test substance given as typically 95.0 % minimum.

REFERENCES

Schenectady International Inc. Technical Datasheet (11/93).

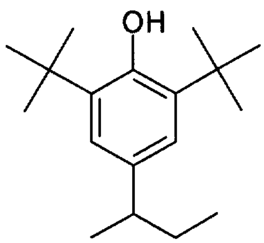
OTHER

3.1 VAPOUR PRESSURE

TEST SUBSTANCE

4-*sec*-Butyl-2,6-di-*tert*-butylphenol

CAS No. 17540-75-9



METHOD

Method/guideline followed: calculation.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Vapour pressure: 2.07×10^{-5} mm Hg at 25°C (0.0028 Pa).

CONCLUSIONS

The calculated vapour pressure is 2.07×10^{-5} mm Hg at 25°C.

DATA QUALITY

Calculation.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. MPBWIN v 1.30.

OTHER

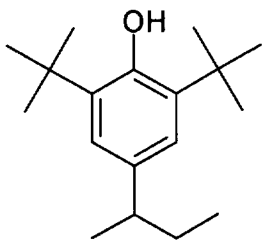
Modified Grain Method used.

4.1 PARTITION COEFFICIENT

TEST SUBSTANCE

4-*sec*-Butyl-2,6-di-*tert*-butylphenol

CAS No. 17540-75-9



METHOD

Method/guideline followed: calculation.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Log Kow: 6.43.

CONCLUSIONS

The test substance has a calculated log Kow of 6.43.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. KOWWIN v 1.63.

OTHER

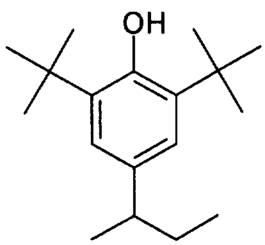
Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 (Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994).

5.1 WATER SOLUBILITY

TEST SUBSTANCE

4-*sec*-Butyl-2,6-di-*tert*-butylphenol

CAS No. 17540-75-9



METHOD

Method/guideline followed: calculation method using a calculated log Kow of 6.43.GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Water solubility: 0.2479 mg/l at 25°C.

CONCLUSIONS

The calculated water solubility of the test substance is 0.2479 mg/l at 25°C.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. WSKOW v 1.33.

OTHER

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 (Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994).

The log Kow value (7.17) calculated using the programme KOWWIN (see 4.1) has been used for the calculation of water solubility.

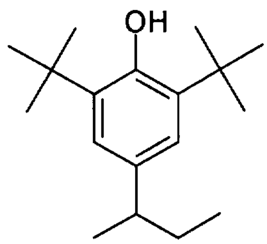
ENVIRONMENTAL FATE AND PATHWAY ELEMENTS

6.1 PHOTODEGRADATION

TEST SUBSTANCE

4-*sec*-Butyl-2,6-di-*tert*-butylphenol

CAS No. 17540-75-9



METHOD

Method/guideline followed: calculation using the programme AOPWIN v1.88.

Test type: calculation of the rate constant for the atmospheric reaction between photochemically produced hydroxyl radicals and the test substance in the vapour phase.

GLP (Y/N): no.

Year study performed: calculation made for this HPV submission.

RESULTS

Sensitizer: hydroxyl radical.

Overall hydroxyl rate constant: 20.5×10^{-12} cm^3/molecule-sec.

Half-life: 6.27 hours.

CONCLUSIONS

The programme estimates that in a typical atmosphere 50% of the test substance will undergo reaction in 6.27 hours.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. AOPWIN v 1.88.

OTHER

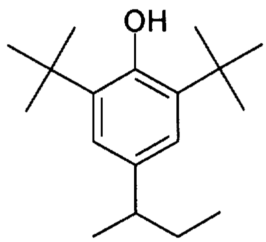
No experimental data was found on direct aqueous photolysis of the test substance. However, *p*-cresol, a related substance, in aqueous solution is reported as having a half-life of 35 days in sunlight (Smith, J.H. et al, "Environmental Pathways of Selected Chemicals in Freshwater Systems: Part II. Laboratory Studies," EPA-600/7-78-074, May 1978. Cited in Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, page 8-38.

7.1 STABILITY IN WATER

TEST SUBSTANCE

4-*sec*-Butyl-2,6-di-*tert*-butylphenol

CAS No. 17540-75-9



COMMENT

No abiotic hydrolysis studies were located.

The category phenols do not possess any functional groups that are regarded as being susceptible to hydrolysis under environmental conditions (Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, pages 7-4 and 7-5).

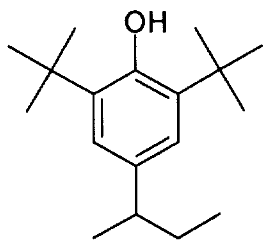
The software prediction programme HYDROWIN v1.66 cannot estimate hydrolysis rate constants for phenols.

8.1 TRANSPORT BETWEEN ENVIRONMENTAL COMPARTMENTS (FUGACITY)

TEST SUBSTANCE

4-*sec*-Butyl-2,6-di-*tert*-butylphenol

CAS No. 17540-75-9



METHOD

Test type: Calculation of partitioning between environmental compartments.

Year study performed: Model run for this HPV submission.

Model: Level 1 Fugacity-Based Environmental Partitioning Model v2.11.

Input values

Chemical specific

Molecular mass:	262
Data temperature (°C):	25
Water solubility (mg/l):	0.2479
Vapour pressure (Pa):	0.0028
Log Kow:	6.43
Melting point (°C):	47

Environmental conditions: defaults used.

RESULTS

Environmental compartment	Percentage of test substance
Air	0.0245
Soil	97.7
Water	0.041
suspended sediment	0.068
fish	0.0055
Sediment	2.17

DATA QUALITY

The Mackay Level I Fugacity Model estimates the equilibrium distribution of a fixed quantity of a non-reacting chemical in a closed environment at equilibrium; with no degradation reactions and no flow or intermedia transport processes. The chemical is assumed to distribute instantaneously to an equilibrium concentration and therefore the medium receiving the emission is unimportant. This model is an aid to understanding the physical chemistry properties that are of greatest importance in determining the environmental distribution of substances; it is not a tool to predict actual or likely concentrations in a real environment.

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 and therefore their physical chemistry properties are unlikely to be affected by the pH values normally found in the environment.

REFERENCES

This software program is available with the publication: Mackay, D., Multimedia environmental models: the fugacity approach, Lewis Publishers Inc., Chelsea, MI, 1991.

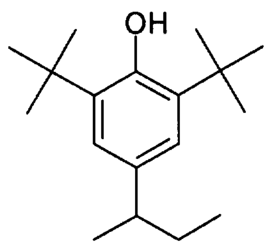
OTHER

9.1 BIODEGRADATION

TEST SUBSTANCE

4-*sec*-Butyl-2,6-di-*tert*-butylphenol

CAS No. 17540-75-9



METHOD

Method/guideline followed: calculation using the programme BIOWIN v3.65.

Test type: calculation of the probability for rapid aerobic biodegradation of the test substance in the presence of mixed populations of environmental microorganisms.

GLP (Y/N): no.

Year study performed: calculation made for this HPV submission.

RESULTS & CONCLUSIONS

The program predicts:

Primary biodegradation in weeks

Ultimate biodegradation in months.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. BIOWIN v 3.65.

OTHER

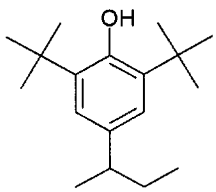
ECOTOXICITY ELEMENTS

10.1 ACUTE TOXICITY TO FISH

TEST SUBSTANCE

4- *sec*- Butyl- 2, 6-*di*- *tert*-butylphenol

CAS No. 17540-75-9



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Fish

Exposure period: 95hours, 30days, 90 days

RESULTS

LC50 (96hr) 0.072 mg/l

ChV (30day) 0.010 mg/l

ChV (90day) 0.003 mg/l

Remarks: log Kow used 6.43 (calculated value)

CONCLUSIONS

Estimated LC50 (96hr) value for the test substance was found to be 0.072 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v 0.99e

OTHER

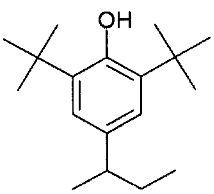
Calculation performed for this HPV submission.

11.1 ACUTE TOXICITY TO ALGAE

TEST SUBSTANCE

4- *sec*- Butyl- 2, 6-*di*- *tert*-butylphenol

CAS No. 17540-75-9



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e	
GLP: (N)	
Year study performed: 2000	

Species: Green algae

Exposure period: 96 hours

RESULTS

EC50 (96hr) 0.016 mg/l

ChV (96hr) 0.020 mg/l

Remark: log Kow used 6.43 (calculated value)

CONCLUSIONS

Estimated EC50 (96hr) value for the test substance was found to be 0.016 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v 0.99e

OTHER

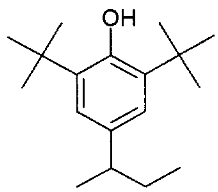
Calculation performed for this HPV submission.

12.1 ACUTE TOXICITY TO AQUATIC INVERTEBRATES (E.G., DAPHNIA)

TEST SUBSTANCE

4- *sec*- Butyl- 2, 6- *di-tert*-butylphenol

CAS No. 17540-75-9



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e	
GLP: (N)	
Year study performed: 2000	

Species: Daphnid

Exposure period: 48hours, 21 days

RESULTS

LC50 (48hr) 0.22 mg/l

ChV (21day) 0.008 mg/l

Remark: log Kow used 6.43 (calculated value)

CONCLUSIONS

Estimated LC50 (48hr) value for the test substance was found to be 0.22 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v 0.99e

OTHER

Calculation performed for this HPV submission.

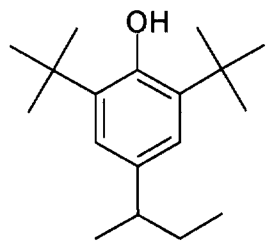
HEALTH ELEMENTS

13.1 ACUTE TOXICITY
ORAL

TEST SUBSTANCE

4-*sec*-Butyl-2,6-di-*tert*-butylphenol

CAS No. 17540-75-9



METHOD

Acute Oral LD50 Toxicity Study in Rats – according to the method of C.S. Weil, Biometrics 249 (1952)	
GLP: (Y)	
Year study performed: 1980	

Species: Sprague-Dawley CD rats

Sex: Male and female

No of animals per sex per dose: 20 males, 20 females

Vehicle: Test articles in a dosing media prepared on a w/v basis.

RESULTS

The LD50 with 95% confidence limits was estimated to be 4.8 (2.7 – 8.1) g/kg.

Clinical signs of toxicity included decreased motor activity, diarrhoea, piloerection, co-ordination loss and lethargy. Necropsy indicated irritation to the intestines.

Necropsy results:

Macroscopic examination at the study termination revealed bright red lungs, dark red mottled liver, intestinal irritation, nasal and ocular haemorrhage and diarrhoea in males and wet ventral surface in one female dosed at 3.4 g/kg.

In addition to these effects, in the test group dosed at 4.7 g/kg, slight hair loss was noted from ventral surface in one male and one female.

In the test group dosed at 6.6 g/kg and 9.3 g/kg necropsy examination revealed diarrhoea, lacrimation, wet ventral surface, stomach and intestinal irritation, stomach filed in food, hair loss from posterior ventral surface, lungs bright red mottled, small dark spots on thymus, and nasal and ocular haemorrhage in both males and females.

CONCLUSIONS

LD50 for 4-sec-butyl-2,6-tert-butyl phenol was found to be 4.8 g/kg.

DATA QUALITY

Study to GLP and guidelines

REFERENCES

Springborn Institute for Bioresearch Inc., Spencerville, Ohio 45887
Lab Study No.: 3076.16, Report date: 12/18/80.

OTHER

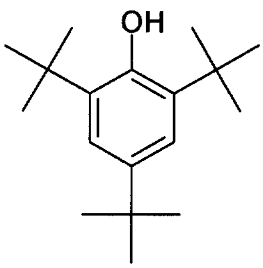
PHYSICAL/CHEMICAL ELEMENTS

1.1 MELTING POINT

TEST SUBSTANCE

2,4,6-Tri-*tert*-butylphenol

CAS No. 732-26-3



METHOD

Method/guideline followed: information not available in database.

GLP (Y/N): No.

Year study performed: 1949.

RESULTS

Melting point: 131°C.

CONCLUSIONS

The test substance has a melting point of 131°C.

DATA QUALITY

Not a GLP study.

Classed as handbook data by the Beilstein database.

Purity of the test substance / decomposition: information not available in database.

REFERENCES

Sears, K., J. Amer. Chem. Soc., 71 (1949) as quoted in the Beilstein database.

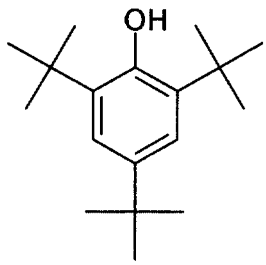
OTHER

2.1 BOILING POINT

TEST SUBSTANCE

2,4,6-Tri-*tert*-butylphenol

CAS No. 732-26-3



METHOD

Method/guideline followed: information not available in database.

GLP (Y/N): no.

Year study performed: 1944.

RESULTS

Boiling point: 278°C.

Pressure: atmospheric.

CONCLUSIONS

The test substance has a boiling point of 278°C.

DATA QUALITY

Not a GLP study.

Classed as handbook data by the Beilstein database.

Purity of the test substance / decomposition: information not available in database.

REFERENCES

Pardee, W., Ind. Eng. Chem., 36 (1944) as quoted in the Beilstein database.

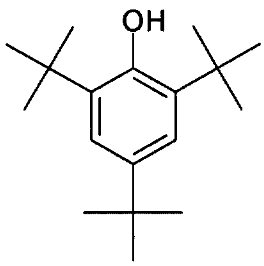
OTHER

3.1 VAPOUR PRESSURE

TEST SUBSTANCE

2,4,6-Tri-*tert*-butylphenol

CAS No. 732-26-3



METHOD

Method/guideline followed: information not available in database.

GLP (Y/N): no.

Year study performed: 1984.

RESULTS

Vapour pressure: 0.000661 mm Hg @ 25°C (0.088 Pa).

CONCLUSIONS

The test substance has a vapour pressure of : 0.000661 mm Hg @ 25°C.

DATA QUALITY

Not a GLP study.

Purity of the test substance / decomposition: information not available in database.

REFERENCES

Perry, R.H. and Green, D. (1984); Perry's Chemical Engineers' Handbook., 6th ed. McGraw-Hill, New York as quoted in SRC PhysProp database.

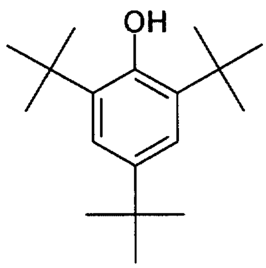
OTHER

4.1 PARTITION COEFFICIENT

TEST SUBSTANCE

2,4,6-Tri-*tert*-butylphenol

CAS No. 732-26-3



METHOD

Method/guideline followed: not known

GLP (Y/N): not known.

Year study performed: 1992.

RESULTS

Log Kow: 6.06.

CONCLUSIONS

The test substance has a log Kow of 6.06.

DATA QUALITY

Temperature and test substance purity not available.

Information taken from SRC PhysProp Database.

REFERENCES

Chem Inspection and Testing Institute; Biodegradation and Bioaccumulation Data of Existing Chemicals; Japan Chemical Industry Ecology-Toxicology and Information Centre. ISBN 4-89074-101-1 (1992) as quoted in the SRC PhysProp Database.

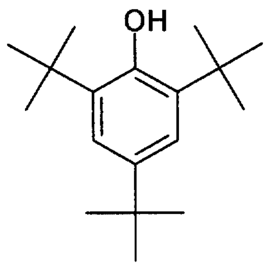
OTHER

5.1 WATER SOLUBILITY

TEST SUBSTANCE

2,4,6-Tri-*tert*-butylphenol

CAS No. 732-26-3



METHOD

Method/guideline followed: calculation using a log Kow value of 6.39.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Water solubility: 0.267 mg/l @ 25°C.

CONCLUSIONS

The test substance has a calculated water solubility of 0.267 mg/l @ 25°C.

DATA QUALITY

Calculation method

REFERENCES

SYRACUSE Chemical Properties Prediction Program. WSKOW v 1.33.

OTHER

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 (Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994).

The log Kow value (6.39) calculated using the programme KOWWIN (see 4.1) has been used for the calculation of water solubility.

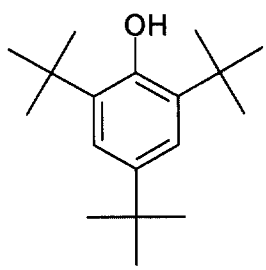
ENVIRONMENTAL FATE AND PATHWAY ELEMENTS

6.1 PHOTODEGRADATION

TEST SUBSTANCE

2,4,6-Tri-*tert*-butylphenol

CAS No. 732-26-3



METHOD

Method/guideline followed: calculation using the programme AOPWIN v1.88.

Test type: calculation of the rate constant for the atmospheric reaction between photochemically produced hydroxyl radicals and the test substance in the vapour phase.

GLP (Y/N): no.

Year study performed: calculation made for this HPV submission.

RESULTS

Sensitizer: hydroxyl radical.

Overall hydroxyl rate constant: 14.4×10^{-12} cm^3/molecule-sec.

Half-life: 8.0 hours.

CONCLUSIONS

The programme estimates that in a typical atmosphere 50% of the test substance will undergo reaction in 8.0 hours.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. AOPWIN v 1.88.

OTHER

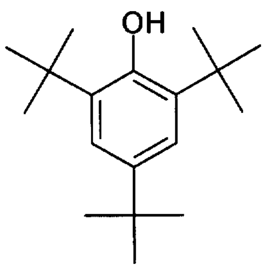
No experimental data was found on direct aqueous photolysis of the test substance. However, *p*-cresol, a related substance, in aqueous solution is reported as having a half-life of 35 days in sunlight (Smith, J.H. et al, "Environmental Pathways of Selected Chemicals in Freshwater Systems: Part II. Laboratory Studies," EPA-600/7-78-074, May 1978. Cited in Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, page 8-38.

7.1 STABILITY IN WATER

TEST SUBSTANCE

2,4,6-Tri-*tert*-butylphenol

CAS No. 732-26-3



COMMENT

No abiotic hydrolysis studies were located.

The category phenols do not possess any functional groups that are regarded as being susceptible to hydrolysis under environmental conditions (Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, pages 7-4 and 7-5).

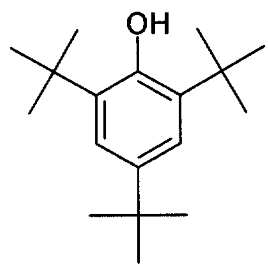
The software prediction programme HYDROWIN v1.66 cannot estimate hydrolysis rate constants for phenols.

8.1 TRANSPORT BETWEEN ENVIRONMENTAL COMPARTMENTS (FUGACITY)

TEST SUBSTANCE

2,4,6-Tri-*tert*-butylphenol

CAS No. 732-26-3



COMMENT

Test type: Calculation of partitioning between environmental compartments.

Year study performed: Model run for this HPV submission.

Model: Level 1 Fugacity-Based Environmental Partitioning Model v2.11.

Input values

Chemical specific

Molecular mass:	262
Data temperature (°C):	25
Water solubility (mg/l):	0.267
Vapour pressure (Pa):	0.088
Log Kow:	6.06
Melting point (C):	131

Environmental conditions: defaults used.

RESULTS

Environmental compartment	percentage of test substance
Air	1.65
Soil	96.1
Water	0.095
suspended sediment	0.067
fish	0.0054
Sediment	2.13

DATA QUALITY

The Mackay Level I Fugacity Model estimates the equilibrium distribution of a fixed quantity of a non-reacting chemical in a closed environment at equilibrium; with no degradation reactions and no flow or intermedia transport processes. The chemical is assumed to distribute instantaneously to an equilibrium concentration and therefore the medium receiving the emission is unimportant. This model is an aid to understanding the physical chemistry properties that are of greatest importance in determining the environmental distribution of substances; it is not a tool to predict actual or likely concentrations in a real environment.

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 and therefore their physical chemistry properties are unlikely to be affected by the pH values normally found in the environment.

REFERENCES

This software program is available with the publication: Mackay, D., Multimedia environmental models: the fugacity approach, Lewis Publishers Inc., Chelsea, MI, 1991.

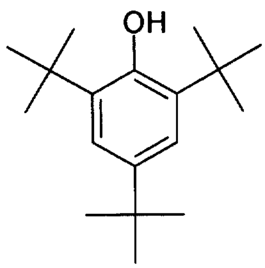
OTHER

9.1 BIODEGRADATION

TEST SUBSTANCE

2,4,6-Tri-*tert*-butylphenol

CAS No. 732-26-3



METHOD

Method/guideline followed: calculation using the programme BIOWIN v3.65.

Test type: calculation of the probability for rapid aerobic biodegradation of the test substance in the presence of mixed populations of environmental microorganisms.

GLP (Y/N): no.

Year study performed: calculation made for this HPV submission.

RESULTS & CONCLUSIONS

The program predicts:

Primary biodegradation in days - weeks

Ultimate biodegradation in weeks - months.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. BIOWIN v 3.65.

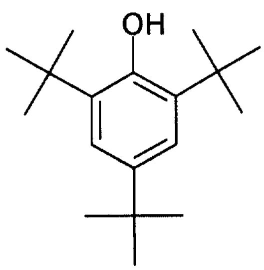
OTHER

10.1 ACUTE TOXICITY TO FISH

TEST SUBSTANCE

2,4,6-Tri-*tert*-butylphenol

CAS No. 732-26-3



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2001

Species: Fish

Exposure period: 96 hours, 14 days, 30 days, 90 days

RESULTS

LC50 (96hr)	0.076 mg/l
ChV (30 day)	0.011 mg/l
ChV (90 day)	0.003 mg/l

Remark: log Kow used 6.39 (calculated value)

CONCLUSIONS

Estimated LC50 (96hr) for the test substance was found to be 0.076 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v.0.99e

OTHER

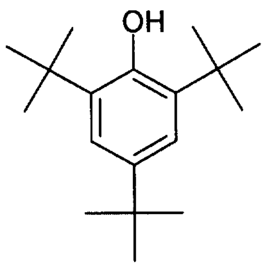
Calculation performed for this HPV submission

11.1 ACUTE TOXICITY TO ALGAE

TEST SUBSTANCE

2,4,6-Tri-*tert*-butylphenol

CAS No. 732-26-3



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2001

Species: Green algae

Exposure period: 96 hours

RESULTS

EC50 (96hr) 0.017 mg/l

ChV (96hr) 0.021mg/l

Remark: log Kow used 6.39 (calculated value)

CONCLUSIONS

Estimated EC50 (96hr) for the test substance was found to be 0.017 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v.0.99e

OTHER

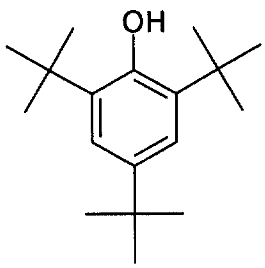
Calculation performed for this HPV submission

12.1 ACUTE TOXICITY TO AQUATIC INVERTEBRATES (E.G., DAPHNIA)

TEST SUBSTANCE

2,4,6-Tri-*tert*-butylphenol

CAS No. 732-26-3



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2001

Species: Daphnid

Exposure period: 48 hours, 21 days

RESULTS

LC50 (48hr) 0.226 mg/l

ChV (21day) 0.008 mg/l

Remark: log Kow used 6.39 (calculated value)

CONCLUSIONS

Estimated LC50 (48hr) for the test substance was found to be 0.226 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v.0.99e

OTHER

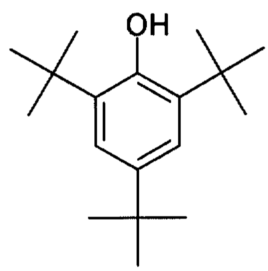
Calculation performed for this HPV submission

HEALTH ELEMENTS

13.1 ACUTE TOXICITY
ORAL

TEST SUBSTANCE

2,4,6-Tri-*tert*-butylphenol



CAS No. 732-26-3

Purity of the test substance: Specific value not given but claimed to be of high purity.

METHOD

Method: Not specified, but based on EU and US EPA guidelines.
GLP: Data not available
Year study performed: 1989

Species/strain: Wistar rat

Sex: assumed 5 males and 5 females

No. of animals per sex per dose: 10

Vehicle: The test substance suspended in olive oil

Route of administration: Oral

Dose level: Not specified. At least 6 increasing dose levels were selected and tested.

RESULTS

The LD50s were calculated using the Litchfield and Wilcoxon method.

LD50 male: 1670 mg/kg/body weight (95% confidence limits 1507 – 1851)

LD50 female: 1610 mg/kg/body weight (95% confidence limits 1423 – 1821)

Clinical signs included sedation and ataxia. Necropsy findings revealed swelling of liver and adrenal.

CONCLUSIONS

The liver was identified as a target organ.

DATA QUALITY

Method claimed to follow EC and US EPA protocol.

REFERENCES

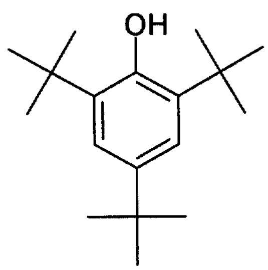
Acute Toxicity to 113 Environmental Chemicals.
Science Reports of the Research Institutes - Tohoku University, Series C: Medicine
Vol. 36, Nos. 1-4, 1989.

OTHER

16.1 REPEATED DOSE TOXICITY
24-month dietary

TEST SUBSTANCE

2,4,6-Tri-*tert*-butylphenol



CAS No. 732-26-3

Purity of the test substance: 97%.

METHOD

Method: Not specified
Test type: 24 months
GLP: Data not available
Year study performed: 1991

Species/strain: Slc: Wistar rats

Route of administration: Oral, feed

Exposure period: 24 months

Dose/concentration: 0, 30, 100, 300 and 1000 ppm. The highest dose was equivalent to approximately 1/20 of the LD50 value (1670 mg/kg in male) obtained from a preliminary acute toxicity test.

Sex: Males and females

No of animals per sex per dose: 40 males and 40 females

Frequency of treatment: Continuous in the diet.

Control group and treatment: Yes, concurrent, no treatment

Post exposure observation period: None

Statistical methods: One-way analysis of variance (ANOVA) with Dunnett's multiple comparison procedure.

Test conditions: Four-week old Wistar rats were divided into the 5 groups. The animals were fed diet containing the test substance for 24 months. General condition and body weights were observed and recorded throughout the experiment. Haematological and histopathological examinations were performed for all groups.

RESULTS

NOAEL 30 ppm (slight changes of haemoglobin concentration (Hb), mean corpuscular volume (MCV), blood urea nitrogen (BUN), glutamate oxaloacetate transaminase (GOT), phospholipids (PL), total cholesterol (T-Chol) and γ-glutamyl transpeptidase (γ-GTP) levels, but with liver and kidney weights within normal ranges, were found at this level).

Clinical signs:
Significant reduction in body weight gain was found in female animals of the 1000 ppm group, 12 months after the start of the experiment and thereafter. No remarkable general findings and changes in food consumption were observed in the control and treated groups throughout the experimental period. Mortality in treated rats was comparable to that of controls.

Haematological and serum biochemistry findings:
6 months: Significant decreases of Hb and MCV and significant increases of platelet count (Plt) (except in animals receiving 300 ppm), PL and T-Chol values were observed in male groups receiving 300 and 1000 ppm. Significant decreases of MCV and GOT and significant increases of T-Chol and γ-GTP values were observed in all treated female groups. Significant decreases of Hb in the 300 and 1000 ppm groups and BUN in the 30 and 1000 ppm groups, and significant increases of Plt in the 300 and 1000 ppm groups and γ-GTP in the 1000 ppm group were also found.

12 months: In males, significant decreases of Hb in the 1000 ppm group, MCV in the 30, 300 and 1000 ppm groups and γ-GTP in the 30 and 100 ppm groups were observed. Levels of BUN and GOT in the 300 and 1000 ppm groups and PL and T-Chol in the 1000 ppm groups were significantly elevated. In females, significant decreases of Hb in the two higher groups, MCV in the three higher groups, GOT in all treated groups and γ-GTP in the 100 ppm group were observed. Significant increases of Plt and PL in the 100, 300 and 1000 ppm groups and T-Chol in all treated groups were found.

18 months: In males, significant decrease of MCV in the 1000 ppm group, and significant increases of BUN in the 100 and 300 ppm groups and γ-GTP in the 1000 ppm group were observed. In all treated female groups, significant decreases of Hb (except the 100 ppm group) and MCV, and significant increases of PL and T-Chol were observed. Significant decreases of GOT in the 30 and 300 ppm groups and γ-GTP in the 30 ppm group, and significant increases of Plt in the 300 and 1000 ppm group were also found.

24 months: In males, significant decreases of MCV in the 1000 ppm group, and significant increases of Plt in the 1000 ppm group and PL and T-Chol in the 100, 300 and 1000 ppm groups were observed. In females, significant decreases of MCV in the 300 and 1000 ppm groups and γ-GTP in the 1000 ppm group, and significant increases of Plt in the 1000 ppm group and PL and T-Chol in all treated groups were found.

Organ weight changes:
Significant increases of relative liver weight in male rats receiving 300 and 1000 ppm and in all female treated groups except the 30 ppm at 12 months were found throughout the study. Significant increases of kidney weights were observed in the animals receiving 1000 ppm at 12 months, in females receiving 1000 ppm at 18 months and in the males receiving 1000 ppm and females receiving 100, 300 and 1000 ppm at 24 months. Significant increases of adrenal weights in the higher dose groups were also observed.

Histopathological findings:
In the 300 and 1000 ppm groups, swelling, focal necrosis and vacuolisation of liver cells were noted from 6 months after the start. No other significant histopathological changes including neoplastic lesions were observed in other organs throughout the study.

Remarks:
In a previously carried out 3-month toxicity study, 15 male and 15 female Wistar rats were fed 0, 586, 1760 and 5280 ppm of TTBP (Matsumoto *et al.*, unpublished data). One week after the start of this experiment, marked reduction of body weight gain was noted in animals receiving 1760 and 5280 ppm, with some of the rats rapidly becoming moribund. In these cases, haematological, biochemical and histopathological examinations performed on days 8 to 14 revealed macrocytic anemia, focal necrosis of liver cells and haemorrhage in almost all organs. An increased value of T-Chol, transaminases and γ-GTP were noted in animals receiving 1760 and 5280 ppm, further indicating hepatotoxicity induced by TTBP.
Macrocytic anemia, reduced RCB, PCV and Hb values and inversely elevated MCV were observed following a massive dose of TTBP (Matsumoto and Shirai, 1987).
In another study, administration of 5600 ppm of TTBP in the diet for 7 days to male rats caused a significant reduction in blood coagulability, measured as prothrombin time, activated thromboplastin time and plasma recalcification time (Matsumoto *et al.*, unpublished data). These overall findings would suggest that the changes observed were due to the secondary effects following liver injury.

CONCLUSION

Administration of TTBP caused focal necrosis, swelling and vacuolisation of liver cells, increases in liver weight, slight microcytic anemia and elevation of serum phospholipid and cholesterol levels, presumably occurring as secondary effects following hepatotoxicity. The changes observed in female rats were more severe than those seen in males. Incidences of tumours in TTBP treated groups were not significantly higher than that of control.

DATA QUALITY

Reliable, without restrictions.

Although the test method and GLP data are not available, the test procedure closely follows the current testing guidelines.

REFERENCES

Matsumoto, K., Ochiai, T., Sekita, K., Uchida, O., Furuya, T. and Kurukawa, Y. (1991): Chronic Toxicity of 2, 4,6-Tri-*tert*-butylphenol in Rats. The Journal of Toxicological Sciences, **16**, 167-179
Matsumoto, K. and Shirai, T. (1987): Basic Study on Drug-induced Myelotoxicity : An Application of Bone Marrow Testing to Toxicity Study. Juntendo Med. J., **33**, 74 – 86 (in Japanese)

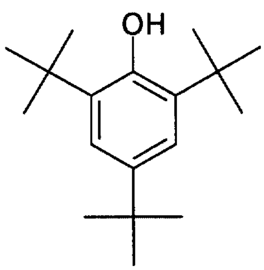
OTHER

16.2 REPEATED DOSE TOXICITY
11 days toxicity in beagle dogs

TEST SUBSTANCE

2,4,6-Tri-*tert*-butylphenol

CAS No. 732-26-3



Purity of the test substance: Data not available

METHOD

Method: Not specified
Test type: 11 days
GLP: Data not available
Year study performed: 1981

Species/strain: Beagle dogs

Route of administration: oral, feed.

Exposure period: 11 days

Dose/concentration: 0, 49.2, 173, 454 mg/kg/day.

Sex: Males

No of animals per sex per dose: 2 males per group.

Frequency of treatment: Daily

Control group and treatment: Yes, concurrent, no treatment

Post exposure observation period: None

Test conditions: Ten months old beagle males were given a daily dose of 2,4,6-*tri-tert*-butylphenol mixed with the dog food.

RESULTS

The food consumption rate was reduced in the high dose group. Diarrhoea was observed in two animals receiving 173 mg/kg and one receiving 454 mg/kg for 3 to 5 days. Faeces of one dog receiving 173 mg/kg and one receiving 454 mg/kg contained blood. Two animals of the high dose group showed signs such as gait abnormality (struggling), blepharoptosia, and decreased body temperature. The animals continued showing these signs until the end of dosing. From this observation, it was concluded that TTBP at this dosage has some effect on the central nervous system (apparently autonomic, principally).

Haematological examination was conducted on Day 11.
Parameters included glutamic-oxalacetic transaminase (GOT), glutamic-pyruvic transaminase (GPT), alkaline phosphatase (ALP), cholinesterase (CHE), total protein (TP), glucose (Glc), total cholesterol (CHO), urea-nitrogen (UN), sodium (Na), potassium (K), calcium (Ca), white blood cells (WBC), red blood cells (RBC), haemoglobin (Hgb) and haematcrit (Hct).

GOT, GPT and ALP increased relative to dose levels (marginal at 49.2 mg/kg).

CONCLUSION

TTBP did not cause haemorrhage or blood coagulation disorder to dogs. Behavioural abnormalities and increase in GOT, GPT and ALP were observed in animals of the highest dose group. Haematological observations indicated that TTBP might affect the liver parenchymal cells and increase metabolizing enzymes.

DATA QUALITY

Methods/guideline – data not given

Purity of the test substance- data not given

REFERENCES

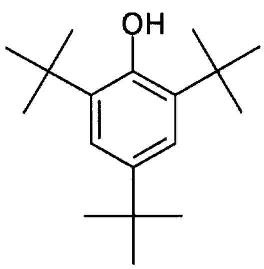
Toxicity of 2,4,6-tri-*tert*-butylphenol in Beagle Dogs, Tokyo Metrop. Res. Lab. Public Health, Tokyo. 32-2, 67-68, 1987.

OTHER
TUMOUR INHIBITORY EFFECTS OF PHENOLIC COMPOUNDS ON BENZO(A)PYRENE-INDUCED NEOPLASIA

TEST SUBSTANCE

2,4,6-Tri-*tert*-butylphenol

CAS No. 732-26-3



Purity of the test substance: 97%

METHOD

Method: See below	
GLP: Data not available	
Year study performed: 1980	

Species/strain: Mouse ICR/Ha strain

Route of administration: Oral, dietary

Exposure period: 38 days

Dose/concentration: 0.03 mmol/g (= 4,500 ppm in diet)

Sex: Females

No of animals per dose: 15

Frequency of treatment: continuous in the diet for 5.5 weeks. 1 mg benzo(a)pyrene (BP) by gavage, twice/week for 4 weeks, from second week of test diet administration.`

Positive control: BP as before, but no dietary addition of the test substance.

Post exposure observation period: 16 weeks

Statistical methods: Student's T test was used to determine the statistical differences in the number of tumors per group between the control and treated groups, and the χ^2test was used for the differences in percentage of tumour bearing animals in these groups.

Test conditions: The mice were placed on a diet containing the test substance or diet without additions (control group) when they were 9 weeks of age. On the eighth day, the mice were given the first of 8 doses (2 times a week for 4 weeks) of 1 mg of BP in 0.2 ml of corn oil. The experimental diets were fed during the entire period of carcinogen administration and were discontinued 3 days after the last dose of carcinogen, at which time the mice were 98 days old. The mice were then fed pellets of rat chow, until they were killed at 211 days old and autopsied. Tumors of the forestomach were counted under a dissecting microscope. Tumors that were 1 mm or larger were recorded and checked histologically.

RESULTS

In the control group (animals given BP but no dietary addition of phenol), 90 – 100% of animals had neoplasms of the forestomach and the average number of tumours per animal was between 4.1 and 5.8. In the animals given dietary addition of 2,4,6-tri-*tert*-butylphenol, 93% of animals had neoplasms of the forestomach and there was no reduction in the number of neoplasms per animal.

CONCLUSION

Substitution of a third *tert*-butyl group *para* to the hydroxyl group apparently destroyed any inhibitory activity of 2,4,6-tri-*tert*-butylphenol in this mouse model, as compared with the di-substituted phenols assessed in this study, which did show inhibitory activity.

DATA QUALITY

Reliable, without restrictions

REFERENCES

Department of Laboratory Medicine and Pathology, University of Minnesota, Minneapolis. Cancer Research 40, 2820- 2823. August 1980.

OTHER

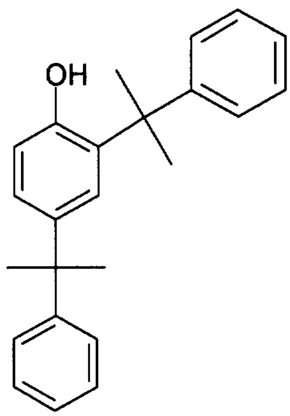
PHYSICAL/CHEMICAL ELEMENTS

1.1 MELTING POINT

TEST SUBSTANCE

2,4- Bis(*alpha, alpha-* dimethylbenzyl)phenol

CAS No. 2772-45-4



METHOD

Method/guideline followed: information not available.GLP (Y/N): no.

Year study performed: not stated.

RESULTS

Melting point: 65°C.

CONCLUSIONS

The test substance has a melting point of 65°C.

DATA QUALITY

Not a GLP study.

Decomposition: information not available.

Information taken from a technical datasheet.

Purity given as 95% minimum.

REFERENCES

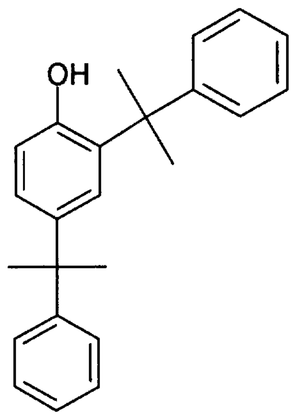
Schenectady International Inc. Technical datasheet.

1.2 MELTING POINT

TEST SUBSTANCE

2,4- Bis(*alpha, alpha*- dimethylbenzyl)phenol

CAS No. 2772-45-4



METHOD

Method/guideline followed: information not available.GLP (Y/N): no.

Year study performed: 1950.

RESULTS

Melting point: 65.5 - 67°C.

CONCLUSIONS

The test substance has a melting point range of 65.5 - 67°C.

DATA QUALITY

Not GLP.

Information taken from a literature search covering appropriate databases.

Information on purity, decomposition and method not available.

REFERENCES

Patent: Goodrich Co., US 2714120 1950.

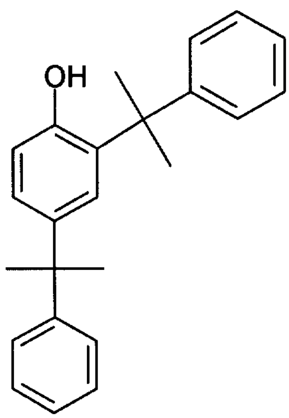
OTHER

2.1 BOILING POINT

TEST SUBSTANCE

2,4- Bis(*alpha, alpha-* dimethylbenzyl)phenol

CAS No. 2772-45-4



METHOD

Method/guideline followed: Schenectady International Inc. internal procedure.

GLP (Y/N): No.

Year study performed: not stated.

RESULTS

Boiling point: >300°C at 760 mm Hg.

CONCLUSIONS

The test substance has a boiling point of >300°C at 760 mm Hg.

DATA QUALITY

Not GLP.

Information taken from a technical datasheet.

Decomposition: information not available.

Purity given as 95% minimum.

REFERENCES

Schenectady International Inc. Technical datasheet.

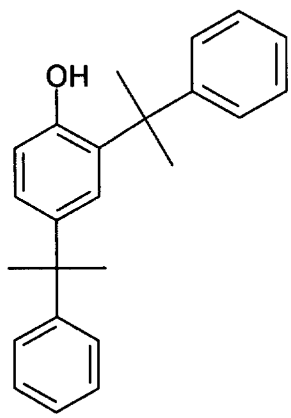
OTHER

3.1 VAPOUR PRESSURE

TEST SUBSTANCE

2,4- Bis(*alpha, alpha*- dimethylbenzyl)phenol

CAS No. 2772-45-4



METHOD

Method/guideline followed: calculation.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Vapour pressure: 5.84×10^{-9} mm Hg @ 25°C (7.8×10^{-7} Pa).

CONCLUSIONS

The test substance has a calculated vapour pressure of 5.84×10^{-9} mm Hg @ 25°C.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. MPBPWIN v 1.30

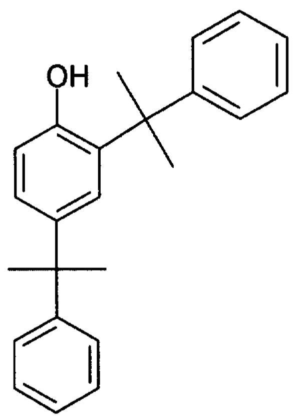
OTHER

4.1 PARTITION COEFFICIENT

TEST SUBSTANCE

2,4- Bis(*alpha, alpha-* dimethylbenzyl)phenol

CAS No. 2772-45-4



METHOD

Method/guideline followed: calculation.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Log Kow: 6.73.

CONCLUSIONS

The test substance has a log Kow of 6.73.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. KOWWIN v 1.63.

OTHER

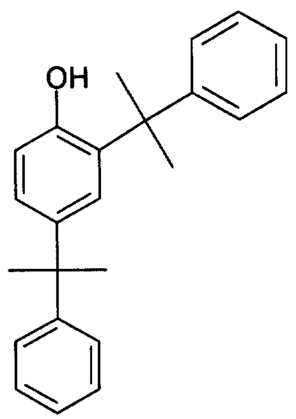
Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 (Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994).

5.1 WATER SOLUBILITY

TEST SUBSTANCE

2,4- Bis(*alpha, alpha*- dimethylbenzyl)phenol

CAS No. 2772-45-4



METHOD

Method/guideline followed: calculation method using a calculated log Kow of 6.73.

GLP (Y/N): no.

Year study performed: parameter value calculated for this HPV submission.

RESULTS

Water solubility: 0.0548 mg/l at 25°C.

CONCLUSIONS

The test substance has a calculated water solubility of 0.0548 mg/l at 25°C.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. WSKOW v 1.33.

OTHER

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 (Mackay, D., Varhannickova, D., Ma, Kuo-Ching & Shiu, Wan-Ying, Chemosphere, Vol 29, No. 6, pp 1155-1224, 1994).

The log Kow value (6.73) calculated using the programme KOWWIN (see 4.1) has been used for this calculation of water solubility.

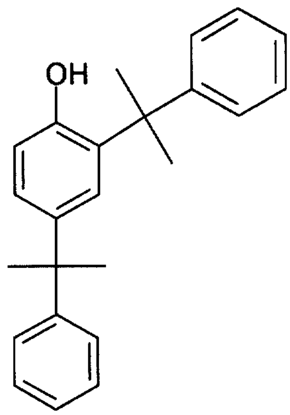
ENVIRONMENTAL FATE AND PATHWAY ELEMENTS

6.1 PHOTODEGRADATION

TEST SUBSTANCE

2,4- Bis(*alpha, alpha*-dimethylbenzyl)phenol

CAS No. 2772-45-4



METHOD

Method/guideline followed: calculation using the programme AOPWIN v1.88.

Test type: calculation of the rate constant for the atmospheric reaction between photochemically produced hydroxyl radicals and the test substance in the vapour phase.

GLP (Y/N): no.

Year study performed: calculation made for this HPV submission.

RESULTS

Sensitizer: hydroxyl radical.

Overall hydroxyl rate constant: 57.4×10^{-12} cm^3/molecule-sec.

Half-life: 2.24 hours.

CONCLUSIONS

The programme estimates that in a typical atmosphere 50% of the test substance will undergo reaction in 2.24 hours.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. AOPWIN v 1.88.

OTHER

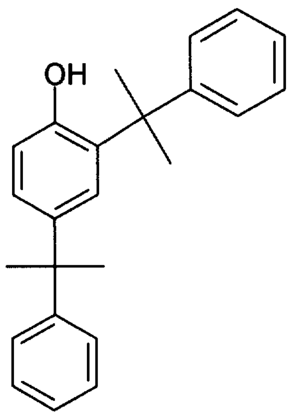
No experimental data was found on direct aqueous photolysis of the test substance. However, *p*-cresol, a related substance, in aqueous solution is reported as having a half-life of 35 days in sunlight (Smith, J.H. et al, "Environmental Pathways of Selected Chemicals in Freshwater Systems: Part II. Laboratory Studies," EPA-600/7-78-074, May 1978. Cited in Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, page 8-38.

7.1 STABILITY IN WATER

TEST SUBSTANCE

2,4- Bis(*alpha, alpha*-dimethylbenzyl)phenol

CAS No. 2772-45-4



COMMENT

No abiotic hydrolysis studies were located.

The category phenols do not possess any functional groups that are regarded as being susceptible to hydrolysis under environmental conditions (Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Calculation Methods, McGraw-Hill, Inc., Washington, 1990, pages 7-4 and 7-5).

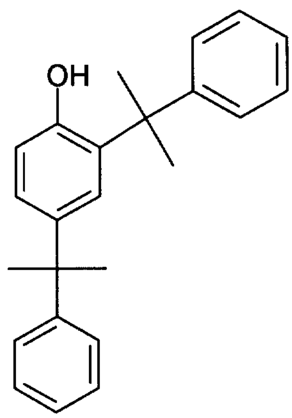
The software prediction programme HYDROWIN v1.66 cannot estimate hydrolysis rate constants for phenols.

8.1 TRANSPORT BETWEEN ENVIRONMENTAL COMPARTMENTS (FUGACITY)

TEST SUBSTANCE

2,4- Bis(*alpha, alpha*-dimethylbenzyl)phenol

CAS No. 2772-45-4



METHOD

Test type: Calculation of partitioning between environmental compartments.

Year study performed: Model run for this HPV submission.

Model: Level 1 Fugacity-Based Environmental Partitioning Model v2.11.

Input values

Chemical specific

Molecular mass:	330
Data temperature (°C):	25
Water solubility (mg/l):	0.0548
Vapour pressure (Pa):	7.8×10^{-7}
Log Kow:	6.73
Melting point (°C):	65

Environmental conditions: defaults used.

RESULTS

Environmental compartment	Percentage of test substance
Air	1.95×10^{-5}
Soil	97.7
Water	0.021

suspended sediment	0.068
fish	0.0055
Sediment	2.17

DATA QUALITY

The Mackay Level I Fugacity Model estimates the equilibrium distribution of a fixed quantity of a non-reacting chemical in a closed environment at equilibrium; with no degradation reactions and no flow or intermedia transport processes. The chemical is assumed to distribute instantaneously to an equilibrium concentration and therefore the medium receiving the emission is unimportant. This model is an aid to understanding the physical chemistry properties that are of greatest importance in determining the environmental distribution of substances; it is not a tool to predict actual or likely concentrations in a real environment.

Alkylphenols are weak acids with typical pKa values in the range 9.9 to 10.9 and therefore their physical chemistry properties are unlikely to be affected by the pH values normally found in the environment.

REFERENCES

This software program is available with the publication: Mackay, D., Multimedia environmental models: the fugacity approach, Lewis Publishers Inc., Chelsea, MI, 1991.

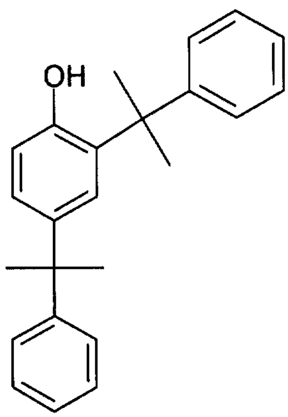
OTHER

9.1 BIODEGRADATION

TEST SUBSTANCE

2,4- Bis(*alpha, alpha*-dimethylbenzyl)phenol

CAS No. 2772-45-4



METHOD

Method/guideline followed: calculation using the programme BIOWIN v3.65.

Test type: calculation of the probability for rapid aerobic biodegradation of the test substance in the presence of mixed populations of environmental microorganisms.

GLP (Y/N): no.

Year study performed: calculation made for this HPV submission.

RESULTS & CONCLUSIONS

The program predicts:

Primary biodegradation in weeks

Ultimate biodegradation in months.

DATA QUALITY

Calculation method.

REFERENCES

SYRACUSE Chemical Properties Prediction Program. BIOWIN v 3.65.

OTHER

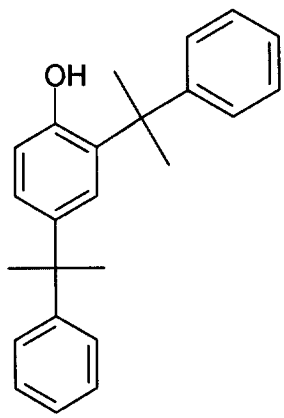
ECOTOXICITY ELEMENTS

10.1 ACUTE TOXICITY TO FISH

TEST SUBSTANCE

2, 4-Bis (*alpha, alpha-* dimethylbenzyl) phenol

CAS No. 2772-45-4



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e
GLP: (N)
Year study performed: 2000

Species: Fish

Exposure period: 96 hours, 30 days and 90 days

RESULTS

LC50 (96hr) 0.059 mg/l

ChV (30 day) 0.008mg/l

ChV (90 day) 0.003 mg/l

Remarks: log Kow used 6.73 (calculated value)

CONCLUSIONS

Estimated LC50 (96hr) for the test substance was found to be 0.059 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v.0.99e

OTHER

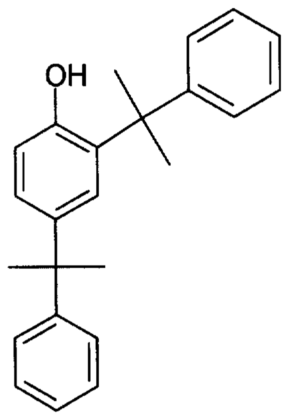
Calculation performed for this HPV submission.

11.1 TOXICITY TO AQUATIC PLANTS (E.G., ALGAE)

TEST SUBSTANCE

2, 4-Bis (*alpha, alpha*- dimethylbenzyl) phenol

CAS No. 2772-45-4



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e	
GLP: (N)	
Year study performed: 2000	

Species: Green algae

Exposure period: 96 hours

RESULTS

EC50 (96hr) 0.011 mg/l

ChV (96hr) 0.016 mg/l

Remark: log Kow used 6.73 (calculated value)

CONCLUSIONS

Estimated EC50 (96hr) for the test substance was found to be 0.011 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v.0.99e

OTHER

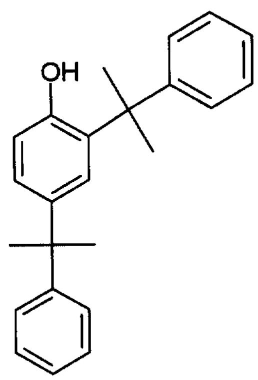
Calculation performed for this HPV submission.

12.1 ACUTE TOXICITY TO AQUATIC INVERTEBRATES (E.G., DAPHNIA)

TEST SUBSTANCE

2, 4-Bis (*alpha, alpha* dimethylbenzyl) phenol

CAS No. 2772-45-4



METHOD

ECOWIN Classes for Microsoft Windows. US EPA, March 1999. Estimated method ECOSAR v 0.99e	
GLP: (N)	
Year study performed: 2000	

Species: Daphnid

Exposure period: 48 hours, 21 days

RESULTS

LC50 (48hr) 0.21 mg/l

ChV (21day) 0.007 mg/l

Remark: log Kow used 6.73 (calculated value)

CONCLUSIONS

Estimated LC50 (48hr) for the test substance was found to be 0.21 mg/l.

DATA QUALITY

Estimation

REFERENCES

ECOSAR v. 0.99e

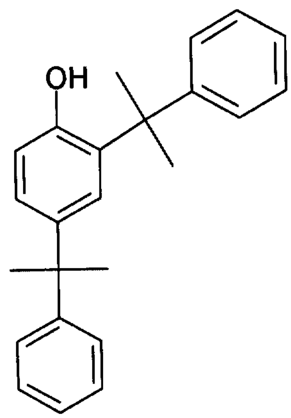
OTHER

Calculation performed for this HPV submission.

HEALTH ELEMENTS

2,4- Bis(*alpha, alpha*- dimethylbenzyl)phenol

CAS No. 2772-45-4



No test reports found